U. S. MAGNETIC OBSERVATORY AT LOS ANGELES, CAL.*

[From Science.]

Magnetic Observation.—There is at present but one self-registering magnetic observatory within the limits of the United States. That observatory is located in Los Angeles, Cal.; and the object of the present article is to present a brief description of the observatory and its work, together with a short account of its origin.

Continuous series of magnetic observations, covering longer or shorter periods, have been made at several stations in North America; but, with two exceptions, they have all been made on the eastern side of the continent. We have a series of observations of five years (1840–45) at Girard College, Philadelphia, by A. D. Bache; six years' observations at Key West, Fla. (1860–66), by the U. S. Coast Survey; and a long series, still continuing, at Toronto, Canada (1841–83). We have, further, a series of nearly five years of photographic records taken at Madison, Wis., by the U. S. Coast and Geodetic Survey.

On the western coast the only continuous series of magnetic observations we have were made by the Russian government at Sitka at the magnetic and meteorological observatory established in March, 1842, and maintained until the cession of Alaska to the United States in October, 1867; and the series of hourly observations at Point Barrow in 1852–54 by Capt. Maguire, R.N. Up to the present time, a great part of these observations have remained undigested and undiscussed.

It was therefore contemplated by the Coast Survey, many years ago, to obtain a continuous series of magnetic records from some station on the western coast of the United States; and, with this end in view, an Adie magnetograph of the latest and most approved pattern was purchased in 1860. The outbreak of the war, however, prevented the carrying out of this plan.

The instrument remained packed until 1878, when a favorable time seemed to have arrived to put it to use. Assistant C. A. Schott, aided by Mr. Suess, then set it up for trial in the basement of the Coast Survey office, Washington. Some minor defects of construction were remedied, and the magnetograph set to work in January, 1879. It was kept going for about two weeks on trial, and found to perform satisfactorily. During this time it was inspected by Superintendent Patterson, and its workings observed by various members of the survey. At the close of this trial it was packed up for shipment to some station in California.

It was found, however, that more money would be required to run the instrument than could be then set apart for this work, and it therefore remained in the Coast Survey office.

In response to the invitation of the International Polar Conference, our government consented, in 1881, to the establishment of two observing stations in high northern latitudes. Observations, especially of meteorology and magnetism, were to be undertaken; and it was arranged to carry on these observations under the joint auspices of the Signal Service and Coast and Geodetic Survey. The executive management of these stations, the selection of observers, etc., were put under the direction of the chief signal-officer. The Coast Survey cooperated by furnishing such magnetic instruments as were on hand, and by training, during the short time available for their work, the magnetic observers selected by the signal-office. It is to be regretted that there was not time enough to procure suitable differential instruments for the stations.

Two parties were despatched to the north—one to Lady Franklin Bay, near the northern end of Greenland, under the charge of Lieut. A. W. Greely; and the other to Point Barrow, Alaska, under the direction of Lieut. P. H. Ray. Both these parties reached their destination in the fall of 1881.

It was the wish of the International Polar Conference that all the northern stations should be occupied three years; and a special effort was to be made to secure a complete and continuous record from August, 1882, to August, 1883. In the spring of 1882, additional observers were selected by the Signal office to replace any of the former ones that might have become disabled, or to act as auxiliaries, should such be needed. These magnetic observers, like their predecessors, received instruction at the coast-survey office prior to their departure for the north; and a set of differential magnetic instruments, hastily constructed, was sent to Point Barrow.

The spring of 1882 seemed, therefore, a peculiarly favorable time to put the Adie magnetograph to work, and to secure at one and the same time the long-desired series of magnetic observations from the western coast, and a series which would also be available for comparison with those observations made at the International Polar Conference stations. It was therefore mutually agreed by the Signal and Coast Survey offices to establish a magnetic station at the joint expense of the two offices. In the case of the northern stations, the management was intrusted to the Signal office. The expense of the Lady Franklin Bay station was specifically provided for by act of Congress. The expense of the Point Barrow station was to be borne by the Signal Service and Coast and Geodetic Survey jointly. In the new station to be established in California, and which was to be devoted to observations of magnetism only, the management was left entirely to the Coast Survey.

At first San Diego was suggested as the site of the new station, it being the place on the western coast of the United States farthest from the northern stations. A somewhat better location, nearly as far south, was, however, finally selected in Los Angeles, Cal.

Plans for building were prepared in Washington, and forwarded to Assistant J. S. Lawson, of the Coast and Geodetic Survey, who proceeded to Los Angeles and superintended the selection of a site and erection of a building, in June and July, 1882.

In July, 1882, the instruments were shipped to Los Angeles, Cal., in the care of Mr. Werner Suess, a skillful mechanician in the Coast Survey, and who had attended to the mounting of the instrument in 1878, and to its packing up after the test trial was complete.

At the same time, the writer was assigned to the charge of the observatory, with instructions to mount and adjust the instrument, determine its constants, and proceed to bring out a continuous record of the changes in the elements of the earth's magnetism. Leaving Washington July 26, he arrived in Los Angeles Aug. 7, 1882, where he found Mr. Suess in waiting, and the observatory complete.

After arranging preliminaries, the work of mounting and adjusting the instrument was begun, and pushed forward as rapidly as possible. Observations for the determination of the constants and scale values were made; the compensation of the vertical-force magnet for temperature was made; temperature coefficients were determined; and finally, on Sept. 28, everything was in readiness, and the first sensitive paper was put upon the cylinders, and the first record made. The first few days were in the nature of a trial. A slight re-adjustment was made on Oct. 13, after which everything worked satisfactorily. On Oct. 31 the horizontal and vertical force constants were redetermined; and since that date the instrument has continued to work almost perfectly, and to make a complete and continuous record of the changes of all the magnetic elements.

The observatory is situated in latitude 34° 03′ N., longitude 118° 15′ W. from Greenwich, and 317 ft. above the level of the sea. It is on a rather steep hillside sloping to the southwest in the grounds of the Branch Normal School in the city of Los Angeles, exactly one mile, in a direct line, from the center of the plaza, or park, in the center of the old town, or about a mile from the central business part of the town. Street cars run within two squares of the observatory. It is on adobe soil underlaid by clay, and in the midst of an orange plantation formerly known as Belle Vue Terrace.

The observatory is built of redwood fastened with copper nails, is double walled, with an air-space 2.5 ft. between the walls, which walls are 14 in. thick and filled with adobe soil. It is 28 ft. long by 21 ft. wide, and painted white. The entrance to the observatory is on the south side. On the north side is the photographic or dark room where the various photographic processes are carried on. This room is 12 ft. long by 10 ft. wide. The three magnets are placed, the unifilar or declinometer to the east, the bifilar or horizontal-force magneto meter to the west and the vertical force magnetometer to the north of the central driving-clock. A picture of the instrument, showing it as a whole, and also showing details, may be found in Gordon's "Electricity and Magnetism." For illumination, student-lamps burning kerosene oil are used, and yield satisfactory results. The record is made on paper sensitized by the bromo-iodide process. The paper is sensitized at the observatory. Each trace contains two days' record; and the record is absolutely complete and continuous, except the time lost in changing papers to begin a new record, and in "moving spots" or shifting the luminous dots to get the second day's record on the same sheet. The time required for the first operation is from seven to eight minutes; for the second, from two to three minutes. Thus only about ten minutes are lost in two days, or an average of five minutes per day—a quantity too small to be of any importance on any occasion thus far observed.

One minute of time on the traces is represented by $\frac{1}{10}$ of an inch approximately, and a movement through one minute of arc by the unifilar magnet is represented on the trace by $\frac{1}{10}$ of an inch. A motion of the bifilar magnet of one scale division, represented on the trace by 0.027 inch, corresponds to a change of horizontal force of about its $\frac{1}{370}$ part. The traces can readily be read off within half a scale division, or changes of force of its $\frac{1}{1850}$ part are recorded. This adjustment has not proved too sensitive, as the luminous dot has never left the recording cylinder, except once for a short time during the great magnetic storm of November, 1882.

Visitors are admitted to the observatory, and the traces generally show their presence by a break in the curve.

The instrument records, as is well known, changes of declination, changes of horizontal force, and changes of vertical force. Each of these changes is recorded on a separate sheet, or trace, as it is called; and thus, on an average, forty-five traces are produced each month. These traces are six inches by sixteen inches and a half, and are made on plain photographic paper prepared for use at the observatory.

This preparation consists of two processes, salting and and silvering. The salting process, as it is called, consists in soaking the paper from ten to fifteen minutes in a bath of iodide and bromide of potassium, with a little tincture of iodine added, after which the paper is hung up to dry. This process is carried on in the daylight.

The silvering or sensitizing process is carried on in a room as dark as can well be made, and then lighted up dimly with a red lantern. Some difficulty has been found in keeping the room dark enough, and on some occasions the silvering has been done at night.

For silvering, four wooden trays are placed in a row, the first containing a bath of nitrate of silver, acetic acid and water; the second, distilled water; the third, a weak solution of chloride of ammonium; and the fourth, distilled water. A sheet of salted paper is then floated on tray No. 1, special care and some skill being required to prevent (*a*) any of the solution from getting on the *back* of the sheet, and (*b*) any air-bubbles from clinging to the front side of the sheet. The first defect produces stains, and the second, spots. In about nine minutes the paper is transferred to tray No. 2, being floated on as in the case of No. 1, and a new sheet is floated on tray No. 1. In about nine minutes more, the sheets are moved forward, as before; the paper in No. 2 is floated on No. 3, that in No. 1 is transferred, as before, to No. 2, and a new sheet floated on No. 1. This continues till tray 4 is reached; after which the sensitizing is complete, and the paper is then hung up to dry in the dark. Special care is necessary in hanging up the wet paper to avoid stains from the fingers, from the line, or from the pin which holds the paper on the line.

After drying thoroughly, the papers are taken down, packed in a large envelope, and kept in a dark drawer to be used as needed. From this envelope the sheets are transferred to the three recording cylinders prepared to carry them. They remain two days upon the cylinders, and thus receive two days' record. At quarter past nine A. M. of each alternate day the papers are changed.

Over the central driving-clock is hung a heavy orange-flannel curtain. To change papers, the attendant, with the envelope of sensitive paper, goes behind this flannel curtain, through which sufficient light from the three lamps comes to enable the change to be made without further artificial light. The orange flannel serves to satisfactorily exclude actinic light.

The traces, removed from the cylinders, are then carried in a large envelope to the dark room, and there developed, the developer used being pyrogallic acid. The best developments are those which take place rather quickly, in about ten to fifteen minutes. When the development is slower, the traces are usually found inferior. After the development is complete, the traces are fixed in hyposulphite of soda, cleansed in a saturated solution of alum, washed for about two hours in running water and then hung up to dry. After drying, the date is stamped upon them. The exact instant of beginning and ending of each line on the trace, together with the corresponding scale value, is written on. Time observations, with sextant and artificial horizon, are taken from time to time, usually monthly, to regulate the standard chronometer.

After the traces have been thus completed, they are practically paper negatives, from which any number of copies may be made photographically. Two sets are made by the well-known blue-print process. The traces require no special treatment, such as oiling, waxing, etc., for the successful application of this process.

For tabulating from the traces, it is found most convenient to use a ruler subdivided into hourly divisions for the time scale, and a triangular piece of card-board upon the edge of which is ruled the scale corresponding to the trace to be read. The unifilar and bifilar traces have all been read, tabulated, and the means calculated. The vertical-force traces have not yet been read.

There is also in the magnet room of the observatory a thermograph, which records the temperature every half hour. From the records produced by it the time of maximum temperature in the observatory is found to be about five P. M., and the time of minimum temperature about half-past eight A. M. At these hours the thermometers under the bell glasses and near the magnets are read,

* Communicated with permission of the Superintendent of the U. S. Coast and Geodetic Survey, by Marcus Baker, acting assistant in charge of the observatory.

and from these readings it appears that the magnets are subjected to an average daily range of temperature of about 1½° C.

On the 14th, 15th and 16th of each month observations are made to determine the absolute declination, dip and intensity. These observations are made in the usual manner of taking such observations by field parties in the Coast and Geodetic Survey. Monthly reports and returns of results are made to the superintendent of the Survey.

The declinations and dips have all been computed, but the intensities only approximately as yet. The following table contains the declinations and dips resulting from the monthly absolute determinations. Each declination is the mean derived from the elongation on three successive days, and each dip is the mean of six sets with two needles on the same three days.

U. S. MAGNETIC OBSERVATORY AT LOS ANGELES, LAT. 34° 03′, LONG. 118° 15′ W. G.

		Declination.	Dip.
1882—Sept.	14, 15, 16	14°35.5′ E.	59°30.1′
Oct.	14, 15, 16	33.7	30.2
Nov.	14, 15, 16	34.6	29.7
Dec.	14, 15, 16	32.7	31.6
1883—Jan.	14, 15, 16	35.1	30.8
Feb.	14, 15, 16	31.5	28.4
March	14, 15, 16	32.4	31.7
April	14, 15, 16	32.1	29.2
May	14, 15, 16	32.5	29.7

The horizontal intensity is approximately 5.97 in British units = 0.275 dyne.

U. S. MAGNETIC OBSERVATORY, LOS ANGELES, Cal., June 1, 1883.

INVENTORS AND INVENTIONS.

The number of successful inventors is always large, but the number of unsuccessful ones is very much larger. Only the other day 17,000 models of rejected inventions were sold for old junk. There is always somebody working at the unsaleable problem of perpetual motion or making a flying machine. It not infrequently happens that, after a patent has been refused to an inventor, a subsequent application is granted by a different examiner.

It sometimes happens that a patent is granted to one man after somebody else has failed to receive a patent for the same invention. This is a fruitful source of litigation. Indeed, litigation about patent rights is so common that in the introduction of any valuable patent the legal expenses of defending it are a large part of the capital required. Immense sums were spent in defending Morse's patents for telegraphing, and the various patents for sewing machines, India rubber manufacture, and of the inventions that have revolutionized industrial processes. But, when rights are once established by law, the profits are enormous. It was shown in a recent case before the United States Court that for royalties alone on the manufacture of barbed fence wire more than $1,000,000 a year were paid.

Inventors are now chiefly busy with electricity, and the Patent Office is deluged with devices for making new uses of the modern marvel, or for using it with new appliances. Many of these inventions run in the direction of motors. The opinion has gained some ground lately that storage batteries of electricity are not as successful as was at first expected. It is asserted by some that no storage battery ever gives out as much electricity as it receives, and that every moment decreases the amount yielded. Edison says the best storage battery is a ton of coal, which can be used at any time to drive a dynamo machine. Others, however, still think that the storage battery will produce wonderful results.

Inventors have always sought to utilize the forces of nature for the conservation of power. A good deal of time and money has been spent on efforts to realize the force of the rise and fall of tide. According to some plans the water is to be stored in a reservoir at high tide, and used to turn a water wheel when the tide falls. Another plan is to get the power from the rise and fall of a float. There used to be a tidal mill at Astoria and another at Charleston, S. C. The large amount of land required to get the requisite area of water surface is considered an insuperable objection to tidal mills.

A good deal of money has been expended on solar engines in the hope of getting power out of the sun's rays. John Ericsson, the inventor of the Monitor and a thousand other things, has made some beautiful solar engines, and not long ago an inventor had a model of a solar engine on the top of the Cooper Union building, and managed to get up steam in a boiler. The trouble is, however, that the sun does not always shine, and the solar engine, to be of any practical use, must be accompanied with a storage reservoir of power that can be kept for a rainy day. After all, coal is nothing but the heat of the sun stored in past ages for present use.

There is no telling of what great value the discovery of the simplest fact may be. When bromine was discovered by Ballard in 1824, nothing of importance was expected from it. Now it is a valuable factor in photography, and a useful remedy for nervous affections.

Capital is never wanted to try even the most foolish inventions. Not long ago an inventor had an idea that he could, by the use of a naked wire, produce a return current and avoid electrical disturbances in cables. He could have got the capital to lay a long cable underground to try his experiment. He was with difficulty dissuaded from doing this by a practical man, who saved him lots of money by wrapping several miles of cable about a barrel and arranging the naked wire as proposed by the inventor. The result was a complete failure, but the cost of the experiment was comparatively trifling. This is an illustration of the large amount of money that can be wasted through ignorance. Men will work away at an idea with no knowledge of what has been done or what can be done, only to discover at the end what they should have known at the beginning.

A good deal of money has been spent in the effort to introduce ice machines. There is, however, a strong competition to be encountered, since ice may be had for the gathering, and transportation is cheap.

Fire escapes are numbered by the thousand. Hardly a day passes that the Fire Commissioners are not compelled to test some new plan. A good deal of room is taken up in the Patent Office with the models of these contrivances.

A very good example of the eagerness with which capital can be secured to promote the most chimerical ideas may be seen in the story of the Keely motor. The stockholders have been pretty thoroughly bled already, but are compelled to bleed still more in the hope of saving what they have already expended. The varying fate of capital invested is seen in the contrasting results of the two steam heating companies in New York City, one of which has proved a most lamentable failure, while the other has had a measure of success. It is not so certain that money invested underground will always return a fair interest. It may be necessary to incur great expense when an underground cable gives out, as the whole route may have to be dug up to find the break.

Accidental discoveries have supplied some of the most valuable processes of the industrial arts. It is said that the rolling of cold iron was first suggested by the fact that a workman who was placing a piece of hot iron in the rolls carelessly permitted his tongs to be drawn in. He noticed that they were rolled and not broken. He called the attention of the superintendent to the occurrence, and this led to investigation and experiment and the discovery that cold rolled iron is equal to steel for shafting purposes. The process of rolling iron cold was not long afterward patented, and millions of dollars have been made out of the patent.

There are many similar instances where observing workmen have called attention to valuable processes. A signal one was in the early period of the cotton manufacture, when a good deal of trouble was caused by the cotton sticking to the bobbins. All the workmen in the mill were delayed by the necessity of stopping work to clean the bobbins. At last one workman found a way to obviate the trouble. He, and he alone in all the mill had clean bobbins. For a long time he kept his secret to himself. He finally revealed it on the promise of a pint of beer a day for life. His secret was to "chalk the bobbins." That little scraping of salt on the bobbins saved millions of dollars a year, and the observing workman got not only his beer, but a competence.

Each extension of modern enterprise and skill brings with it a train of inventions. The railway, the telegraph, the steamboat, the development of iron, electricity, and petroleum, have each produced a long line of inventors more or less successful, so that each of these industries might have a creditable exhibition by itself.—*N. Y. Sun.*

TIMBER PRESERVING.

A French apparatus for impregnating and preserving timber, one which is most favorable to the application of the chloride of zinc process, has been patented in the United States, with some slight improvement, by H. E. Kreuter. In brief, it is an application of the old Boucherie plan, which has been in vogue for years in Germany, Austria, France and other foreign countries, where, on account of the lack of abundant timber in many sections, or its inaccessibility, except on lines of road, with consequent high expense in obtaining it, methods of treating timber have been favored and employed universally, principally by the railroads. Any antiseptic agent, with one or two exceptions, can be applied by the apparatus, the Boucherie plan being to make a cross-cut in a log to about nine-tenths of its diameter, insert a wedge, and wind a cord or rope in the edge of the cut, on which the log closes on withdrawing the wedge. In this manner a hollow chamber is formed, and a hole being bored on an incline, a pipe is connected and the antiseptic solution forced in toward either end from the center, penetrating the tubes of the vascular tissue, and driving out the sap, to be replaced by the solution employed. From experience in this method of application, it is asserted that the means is thorough in its results over the whole timber treated, and the fact of treated timber sometimes rotting inside, or at other parts, and remaining partially sound, is accounted for from the fact of imperfect impregnation, the preparation used in some cases obstructing the progress of the antiseptic, instead of equally and entirely distributing it. The logs are regarded sufficiently impregnated when the fluid running from the end contains about three-fourths of the metallic salt employed and no appreciable quantity of sap.

The apparatus employed by the Houston & Texas Central Railroad is different from the one in question. Cars loaded with ties are run on a track leading into a hollow cylinder, where a steam pressure of one hundred and twenty pounds is applied, the sap, steam, etc., finding outlet below, after which an air-pump is applied, and the highest degree of vacuum secured, which, by means of a faucet, draws in heated creosote from another cylinder beneath, the upper reservoir being thus thoroughly filled. A further application is made of about one hundred and fifty pounds pressure, and the timber is left in the cylinder some six hours, when the cars are rolled out. The Kreuter apparatus is much more simple. The French method involved the use of an elevated tank to secure the necessary power for applying the needed pressure, which obviously could not be regulated for different kinds or sizes of timber requiring a varying pressure. In place of the tank a force-pump is employed. Where the timbers are long, the pressure is applied on the end, instead of the center, a wood cap being affixed thereto so as to form the hollow chamber, the antiseptic being unable to permeate the cap across the grain. The apparatus consists of a portable steam engine, the pump and a reservoir, and is placed on a flat car, so as to be moved about on railways or tramways. The logs or timber to be impregnated are placed in a yard on a system of framing, on which the distributing pipes are arranged. The boiler of the engine supplies the direct acting steam-pump, which draws the impregnating fluid by a flexible tube from the mixing tank, forcing it into a wrought iron cylinder. In addition there is a platform for unloading the logs upon the framing, from whence they are rolled up an incline, to be cut by a circular saw. The machinery required for a portable apparatus, with an average capacity of six hundred ties daily, will cost about $2,500. The apparatus only requires separate yard fixtures and caps to be applied to telegraph-poles, bridge-timbers, or any form of timber. The woods with coarse and straight grain, and abounding in fluid sap, are the more readily and perfectly impregnated, while there are some kinds of wood of which the natural durability is so great—as, for instance, cedar—that a treatment is superfluous; while, on the other hand, many kinds of timber, nearly worthless for fuel or building purposes, can be made as durable as any wood, wearing out mechanically and not by rotting. The inventor designs the adoption of the apparatus as an adjunct to saw-mills, where the logs may be treated before being sawed. The cost of impregnating is so slight that the loss of the material employed, in sawdust, slabs, etc., will be of small consequence, and compensated for by the thorough results secured by treating the whole log, with the bark generally on.

The practical lumberman or railroad man is interested to know the sense and nonsense of such methods. The plan is by many opposed on the ground that they want to sell timber, and the faster it is consumed the better for them, and the better the plan for treatment, and more gingerly are they in taking hold of it. It should, however, be reflected that such means, when found to be successful in their results, will increase the value of timber, and probably the profit in its manufacture and sale, while calling into use certain timber heretofore little employed or entirely ignored, and increasing the manufacturing possibilities, while at the same time admitting of applying the woods in less supply to a more limited scope of service, so as to extend their period of abundance. Gum, hemlock, yellow pine, and numerous other varieties of timber which are plenty, come into consideration. If the white pine of the North had competitors more worthy of its steel in the way of general availability, there would be less cause for the howl about its rapid exhaustion, and there are many ways in which treated timber might take its place.

In Austria, Germany and France there are some eighty roads that use treated ties, and thirty-three of them have records of successful processes of treatment. The chloride of zinc method, or burnettizing, takes the preference for several reasons. Its practicability is the best established, the objections to its use are few, and the cost is slight. When applied, it is diluted ninety-nine per cent., Kyanizing, or the use of corrosive sublimate, a poison, is dangerous, the workmen who use it running great risks. Convicts are usually employed for the purpose. Creosoting dates back in its use to ancient Egyptian history. Creosote and cedar oil were employed in embalming mummies, and for general purposes of preservation. The common refined tar used contains one per cent. of creosote. When

timbers are saturated with this they are highly inflammable, but the process is not particularly dangerous to the workmen. There are, in all, some sixty methods of treating timber, only a few of which have borne out a practical test. Pyroxyline of iron is used by repeated application, by means of a hole in the timber, the agent dissolving itself and becoming diffused through the vascular tissues. Soaking in salt, using a solution of gas-tar, rosin and linseed-oil; charring the surface, to protect the body; steaming with creosote, to prevent dry mold; applying sulphate of iron and sulphate of copper, are processes that have met with more or less satisfactory results. A beech fence has already stood twenty-six years, with sulphate of copper. Where dampness gathered around the spikes or nails driven into the material, a chemical action resulted which induced decomposition. The expedient was adopted of dipping the spikes in tar. There are several solutions employed for petrifying, such as carbonate of lime, alum and potash, steaming with chloride of lime and diluted sulphuric acid, etc., but common or Glauber's salt seems as feasible an agent in this way as any that has been tested. In the German experience creosote costs eight times more than chloride of zinc. There is a tie treated at a cost of six cents, while the Houston & Texas Central road finds its creosoting process to cost sixty cents per tie. Superheated steam is also held to weaken the wood by destroying the vascular tissues. By simply dissolving old zinc in acid, chloride of zinc can be made for about two and one-half cents per pound, or it is furnished in tanks at three and one-half cents. The patentee figures the cost of impregnating ties, with the apparatus in proper operation, at about eight cents each. The average life of a tie is found to be about five years, while preserved ties can readily be made to last, as they have in Europe, twenty-five to thirty years.

The Royal Railroad Company, of Hanover, Germany, has sent several specimens of burnettized timber by thepatented process, as follows: Part of the middle of a pine tie which served on the road from 1852 to 1879; a piece from the center of a beech tie which laid in the road from 1854 to 1879; a piece from the center of an oak tie which laid in the road from 1859 to 1879; and other specimens. The testimony is also added that the impregnated timber will wear out mechanically before it will rot. E. Buresch, of the Grand Ducal Railroad, and author of a German work on the subject of timber-preserving, makes some statements of the same character. He tells of pine ties lying in a road from twenty-two to twenty-five years, and when taken out, because of damage to the road, they were undisturbed so far as decomposition was concerned, being made into fence-posts and used in other ways. C. Shaler Smith, the well-known bridge engineer, states that the treatment of wood diminishes its tendency to swell or contract, as observed in timbers put into a bridge at St. Louis, the amount of expansion depending on the wood used. He further says: "I used sweet gum, a wood which rots in four months, and swells one inch and a half in sixteen, as the best wood to experiment with, as it could be had at $10 per thousand. The bridge pavement is nearly two years old, is in first-class condition (the traffic is so great that the average life of a three-inch oak plank was only four months), and out of 1,800 square yards I have had to relay only 260 yards on account of hammocking, and this on the first batch laid; with cedar, oak, pine, ash or elm, there would have been no hammocking at all. It is easily prevented by dipping the block in coal-tar after treatment, or laying them diagonally. I laid the bridge-block with one-fourth inch joints. Hereafter I will immerse the blocks in liquid asphalt or creosote, and without any joints at all." —*The Northwestern Lumberman.*

BLASTING COAL WITH LIME.

[From the Williamsport Gazette and Bulletin.]

A few days ago a successful experiment of blasting coal with lime was made in a Hazleton mine, and was witnessed by a number of prominent coal operators, who were well pleased with the result. The use of this new mining agent, it is claimed, will avoid many of the dangers arising from the use of gunpowder, and in addition purify the air in the mine. The mode of operation is to employ nearly pure carbonate of lime, which, after being carefully calcined, is ground to a fine powder. This is conducted to a hydraulic press having a die 2½ in. in diameter and 7 in. deep. A pressure of forty tons is applied simultaneously to both ends of the column of ground lime, which reduces it from 7 in. to 4¼, thus nearly doubling its density. The cartridge, after having a small groove cut along its sides, is then ready for use. They are then inserted in the hole drilled into the coal, where they are slightly tamped. Water is then introduced with a force-pump, and the steam generated by the action of the water on the lime causes an expansion which cracks away the coal. The claim set up for this material over gunpowder is economy and time in using it, safety where dangerous gases gather, pure air in the mine, and getting the coal out without blowing it to pieces, as is done with powder. It has been tried with satisfactory results in many coal districts in England, Wales and Belgium, and is rapidly taking the place of powder.

PUBLIC BUILDINGS.

The following list showing the public buildings in process of construction throughout the country will especially interest dealers in building supplies, etc.:

Abingdon, Va., court-house, post-office, etc.
Albany, N. Y., custom-house and post-office.
Baltimore, Md., post-office and court-house.
Baltimore, Md., marine hospital.
Boston, Mass., post-office and sub-treasury.
Brooklyn, N. Y., post-office, etc.
Buffalo, N. Y., custom-house and post-office.
Cleveland, Ohio, custom-house, etc.
Cairo, Ill., marine hospital.
Cincinnati, Ohio, custom-house and post-office.
Cincinnati, Ohio, marine hospital.
Charleston, W.Va., post-office, court-house, etc.
Concord, N. H., post-office, court-house, etc.
Columbus, Ohio, court-house, post-office, etc.
Council Bluffs, Iowa, post-office, etc.
Dallas, Texas, court-house, post-office, etc.
Denver, Col., court-house and post-office.
Des Moines, Iowa, court-house and post-office.
Detroit, Mich., court-house, post-office, etc.
Erie, Pa., court-house, post-office, etc.
Frankfort, Ky., court-house, post-office, etc.
Fort Wayne, Ind., court-house, post-office, etc.
Galveston, Tex., court-house, post-office, etc.
Greensborough, N. C., court-house, post-office, etc.
Hannibal, Mo., post-office, etc.
Leavenworth, Kan., court-house, post-office, etc.
Louisville, Ky., court-house, post-office, etc.
Lynchburg, Va., court-house, post-office, etc.
Memphis, Tenn., custom-house and post-office.
Memphis, Tenn., marine hospital.
Marquette, Mich., court-house, post-office, etc.
Minneapolis, Minn., post-office, etc.
Montgomery, Ala., court-house, post-office, etc.
New Orleans, La., custom-house and post-office.
New Orleans, La., marine hospital.
Oxford, Miss., court-house, post-office, etc.
Paducah, Ky., post-office, court-house, etc.
Peoria, Ill, post-office, court-house, etc.
Pensacola, Fla., court-house, post-office, etc.
Poughkeepsie, N. Y., post-office, etc.
Pittsburgh, Pa., court-house and post-office.
Pittsburgh, Pa., marine hospital.
Philadelphia, Pa., post-office and court-house.
Quincy, Ill., post-office, court-house, etc.
Rochester, N. Y., court-house, post-office, etc.
Scranton, Pa., post-office, etc.
Shreveport, La., post-office, court-house, etc.
St. Louis, Mo., custom-house and post-office.
St. Joseph, Mo., post-office, etc.
Syracuse, N. Y., post-office, court-house, etc.
Terre Haute, Ind., post-office, etc.
Toledo, O., custom-house, etc.
Topeka, Kan., court-house and post-office.
Washington, D. C., new Pension Building.
Washington, D. C., State, War and Navy buildings.
Williamsport, Pa., post-office, court-house, etc.

LONDON WATER.

Mr. Crooks and Profs. Odling and Tidy have lately given in their report on the composition and quality of London water during 1882 to the Local Government Board. In that year they examined 2,110 samples of water drawn in nearly equal proportions from the mains of all the seven London companies, testing generally seven samples daily by their color, according to the registers of the color meter; by the quantity of free oxygen and ammonia contained in them; by the amount of oxygen required for oxidation of the organic matter present in them; by their proportions of organic carbon and nitrogen, of nitrates and chlorine, and by their initial hardness in degrees of Clark's scale. The results exhaustively set forth in numerical tables are further illustrated by seven diagrams, in each of which three wave-lines represent the fluctuations throughout the year of discoloration, of the proportion of organic carbon, and of the amount of oxygen required to oxidize the organic matter of the water of the London Company in question. These diagrams show to the eye what the statistics confirm, the remarkable parallelism existing between the degree of discoloration, the amount of organic carbon present in the water as determined by combustion, and the amount of oxygen requisite to oxidation of the organic matter as determined by permanganate. The report altogether would seem to reflect most favorably on the quality of London water. Throughout the whole year the water of the New River Company as determined by the samples was, without exception, "clear, bright and well filtered," a character supported by analyses of other kinds, and only in a few cases in the samples of other companies was the water describable as "turbid," "slightly turbid," or "very slightly turbid." For the nine months from February to October, 1882, the organic matter in the water of all the London companies is estimated at .137 per 100,000, and the highest monthly mean for the same period at 181 per 100,000. There is, however, one important factor in the question with which chemical analysis cannot directly cope—the comparative innocuousness, namely, of the organic matter present in the water according as it is of vegetable origin, or its comparative virulence according as it is of animal origin. As Prof. Huxley in a lecture in 1880 to the Chemical Society said, water as regards chemical analysis may be perfectly unobjectionable, and yet as regards its operation on the human body deadly as prussic acid.—*Nature.*

COMBINED GAS AND ELECTRICAL LIGHT.

M. Somzee has made another attempt to produce a cheap and brilliant light by the combination of gas and electricity. The arrangement comprises an ordinary gas flame, fitted with a curved metallic rod passing through the flame, provided with means for preventing overheating under the action of the electric current, which is taken from a secondary battery. It is claimed, in a notice of the arrangement given in the *Journal de l'Eclairage au Gaz*, that under these conditions the illuminating power is considerably augmented in proportion to the additional expense. The light is also said to be white, and much cooler in respect of radiation than a corresponding light from gas alone; the relative proportion of luminous and heat rays being completely changed. What is supposed to render this combination practicable is the fact that the platinum does not require a great intensity of current, and that "one or two small elements will suffice to supply an ordinary light, and make it give four or five times more light at a cost three times less than gas." These are nearly the same data of cost and illuminating power as to those as to which the public have been made accustomed to by electricians. It is a novelty, however, to find gas introduced into the combination in this fashion. According as the intensity of the current is increased or diminished, the flame may be rendered more luminous or hotter as the case may be, so that the arrangement is "capable of furnishing all gradations, from the brilliant flame to the most calorific radiations." Here, it is evident, is a gas stove and lighthouse in one, and only needing a reliable secondary battery to be capable of use for either purpose.

BONANZA.

Bonanza, like the majority of towns in Colorado is a little quiet at present, principally on account of the majority of her mines not being worked. The Empress Josephine is the only mine that is being worked to any extent at present. Several others are being worked by a small force, but we think that when the new concentrator is completed and starts up, which will be in about a week or ten days, that work will be resumed on the majority of the best mines at least. Bonanza has some good mines, without a doubt; some are low grade and will scarcely pay to ship, but the concentrator will make it pay to work the lowest in the camp.

The Empress Josephine is one of the best mines in the camp. The main shaft is now down about 212 feet, with three levels. In the third level they have recently taken out some very rich ore carrying pyrites, galena, gray copper and brittle silver. The ore body in the different portions of the mine is from 20 to 35 inches in width. They are taking out about 9 tons of ore per day, and are working from twenty-five to thirty men in and around the mine. The ore and waste rock is being hoisted by a first-class steam hoister; the ore is then run through a crusher, screened and washed, which concentrates the ore. A recent mill run showed a value of over $900 per ton. This mine has produced enough gold and silver to pay for all developments, equip the mine with a first-class engine and other machinery, and has paid a fair profit besides.

Paragon, owned by Reed, Sharp & Hanson, has two crosscut tunnels, one 180 ft., the other 70 ft., and 235 ft. of drift on the vein; pay streak 4 ft., sample run, $50 in silver per ton; is being worked by two men.

Pacific, owned by Valentine, Buck & McCrea, is being worked by small force; has shaft 50 ft., and tunnel, 60 ft., is being run to cut the vein; assays $50 in silver and lead.

First Chance is owned by O'Brien, Butters & Co., is eastern extension of Paragon; has two shafts, one 30 and the other 20 ft., and running a cross-cut to cut the vein; assays about $100 per ton.

Yankee Doodle is owned by Cartwright, Lloyd & Dofflemyre, has a shaft 20 ft.; streak of mineral 12 in.; assays $25 in silver and 30 per cent. lead.

Maud S., same owner as above; has tunnel 80 ft.; carries some fine carbonate of iron ore; shows well.

Othello, owned by Garraid, Bedford & Co.; has

a shaft 72 ft.; assayed at bottom of shaft 152 ounces silver; pay streak 18 in.

Rawley, owned by Hurd & Co., has a shaft 91 ft.; is not being worked now, but it is expected that work will soon be commenced again.

Bellmont, owned by Miller & Co.; pay streak 12 in.; carries some fine brittle silver and sulphurets.

Below Sedgwick there are several good claims, as follows:

Sarah Bell, owned by Dr. Wakefield, Getmon & Sheek; shaft 75 ft.; looks well.

Dream, owned by Dofflemyre; has shaft 65 ft.; carries some fine chlorides; has a 4-ft. vein; specimen assays gave returns of $1,000.

We have given a description of a few of the mines in the camp as we were able to get them.

The Colorado Dry Ore Concentrating and Sampling Company will soon have their mill completed. Messrs. Hess, Thurman & Hamilton, the owners, are men who seem to know what they are doing, and will, no doubt, make a grand success of their undertaking. Mr. Thurman, the patentee of the process, is superintending the erection of the mill, and will see that everything is all right.

The process is a dry process, and will no doubt work the majority of the ores in the camp successfully. The building is 118 ft. deep; front, 80 ft.; height, 45 ft. Mr. T. K. Lloyd, proprietor of the Cañon Hotel, is superintending the construction of the carpenter work of the mill. The mill is well and substantially built, and the machinery is all first-class. They expect to be able to start up about the 10th or 12th of this month. If the mine owners will only supply the mill with ore enough to keep it going, Bonanza will soon loom up.

THE NEVADA FOOTPRINTS.

A telegram from Carson, Nevada, announces that Dr. Harkness, of the Academy of Sciences, after a year's examination of the so-called Carson footprints, has reached the conclusion that they were made by big-footed men. These mysterious footprints have for years past and continue to engage the interest of scientists both in this country and Europe. It is still a mooted question as to what kind of biped made the impressions. Prof. E. D. Cope, of this city, said: "The impressions were made by one of two things—either by a man-like being or a sloth. They were not made by man, properly so called, but certainly by a biped, and probably an ape. The difficulty of supposing them made by a sloth lies in the fact that the tracks are all alike, while in the sloth the tracks of the fore differ from the hind feet, and it is not likely, where so large a number exist, the tracks of the fore feet would be all obliterated. Besides, the sloth has enormous claws, and there is no trace of their imprint in the Carson footprints. There are, however, distinct impressions of hair. Unless the creature that made the tracks wore sandals made of hairy skins, the impressions were made by an animal with hair on its feet. If made by a man-like animal, it stepped with a wider straddle in proportion to the size of the feet than men do now. The actual length of the feet is about the same as the human foot now. This is favorable to the theory that the footprints were made by a man-like ape, as in the ape the straddle is much wider in proportion to the length of the foot than with man. This is on account of the width of the hips in the ape tribe. The dispatch referred to is in error in stating that the footprints were supposed to be those of mammoths. There are mammoth tracks in the same locality. I feel positive the tracks were made by a man-like ape or an ape-like man, or it may be by a species of the genus man."

HARDENING SOFT LIMESTONES.

Alkaline silicates are occasionally employed to give certain limestones a greater hardness. When the limestone is saturated with a solution of these salts, it quickly becomes covered with a more or less perfectly impervious glazing; but it is difficult to secure the correct proportions, and soluble salts and water may be left within the stone, the latter causing slow disintegration from subsequent freezing and from other causes. To obviate these disadvantages, M. L. Kessler proposed, in a paper recently presented to the Academy of Sciences of France, to use the fluorsilicates of magnesium, aluminium, zinc and lead, instead of the alkalines used in the former processes. In this case only, insoluble salts would be formed throughout the stone, and a more homogeneous material would be obtained. If great hardness is not aimed at, but only a granular, marble-like surface, it will be sufficient to make a paste of water and the powder of limestone, to let this dry on the stone, and then to apply the silicate. By mixing this with silicates of copper, iron, chromium, etc., the various colors of marbles may be imitated, and the color would, as in the natural rock, be uniform through the whole stone. The materials are not more expensive than those of the older processes.

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.

BY J. JAMES R. CROES, M. AM. SOC. C. E.

(*Continued from page* 377.)

DLIII.—HYDE PARK, ILL.

Hyde Park, Illinois, on Lake Michigan, adjoins Chicago on the south. The town comprises 48 square miles of level ground, and includes within its limits the town of Pullman, Lake Calumet and the Calumet River, 6½ miles long. There are 49 villages and hamlets within its boundaries.

The town was set off from the town of Lake in 1861. The village of Hyde Park, which occupies the northern part of the town, was incorporated in 1872.

Water-works were built by Hyde Park and Lake jointly in 1876. These have been previously described (ENG. NEWS, April 8, 1882, p. 114). In 1882 the town of Hyde Park gave up its interest in them and erected independent works, which went into operation Aug. 1, 1882.

The supply is taken from Lake Michigan. A tunnel 6¼ ft. in diameter is in course of construction under the Lake through indurate clay, so hard as to require blasting. This tunnel is to be over a mile long. Pending its completion, water is taken from the lake by a 16-in. cast-iron pipe laid on the lake bottom for 1,620 ft., and a tunnel 5 ft. 2 in. diameter, on shore for 1,000 ft. to the engine house, whence it is pumped directly into the mains under 41 lbs. pressure by four horizontal direct acting compound condensing steam engines with steam cylinders of 40 and 20 in. and water cylinders of 17½ in. diameter, all of 36 in. stroke, built by the Cope & Maxwell Manufacturing Company. Distribution is by 50 miles of cast iron pipes of from 24 to 4 in. diameter, 13 miles being of the smallest size. There was on March 1, 1883, 286 fire hydrants. The number of taps is not given in the reports, it being only stated that 420 were added during the past year. Surface pipes are of lead.

The population in 1880 was 15,716. It is now claimed to be 40,000. The daily consumption for the eight months ending April 1, 1883, was 1,801,924 gallons.

The works is not given in the reports.

The expenses of maintenance for the year ending April 1 were $30,872 and the receipts $30,120.20.

The bonded debt is not given.

The works are managed by a Water Commissioner, Thomas W. Johnstone. G. Howard-Ellers is Consulting and Superintending Engineer.

DLIV.—JOLIET, ILL.

Joliet, Illinois, in lat. 41° 30′ N., long. 88° 05′ W., is in the valley and on the bluffs bordering the Desplaines River. Settled in 1830, it was incorporated a city in 1853. The river has a fall of 36 ft., creating a fine water-power. Water-works were built in 1880 by a private company, after plans of Jesse W. Starr, taking the supply from a pond and pumping by a Knowles steam pump of 14 in. bore and 16 in. stroke into a stand-pipe 7 ft. in diameter and 145 ft. high.

Distribution is by 10 miles of cast-iron pipes of from 12 to 4 in. diameter with 30 gates and 175 taps. There are sixty fire hydrants set, but not used, the city having declined to accept the works under the contract made with the company before construction. Service pipes are of wrought iron.

The population in 1880 was 11,657. The daily consumption in 1882 was 600,000 gallons.

The capital stock of the company, which is now insolvent and in the hands of a receiver, is $200,000. The works cost $75,000. The expenses in 1882 were $6,000 and the receipts $3,000.

The works are managed by the receiver, J. D. Rayé.

THE BOSTON GAS-WORKS, three large structures, are in process of erection. It is proposed to eventually supply the whole city from these works.

RAILROAD BUILDING IN THE SOUTHWEST.—In the early part of 1880 there was not a single mile of railroad in operation in the Territory of New Mexico. To-day, the Atchison, Topeka & Santa Fe, including its three branches, has 587 miles, the Southern Pacific 198 miles, the Atlantic & Pacific 174 miles, the Deming & Silver City 60 miles and the Denver & Rio Grande 121 miles, making a total of 1,140 miles. All these railroads are paying well, excepting the Denver & Rio Grande branch, which has no outlet in the central and southern part of the Territory, but which will be supplied when the branch of the Texas, Santa Fe & Northern is completed from Espanola to Santa Fe. There are now in course of construction in the Territory railroads whose plans call for 891 miles of road within the boundaries of New Mexico, when they are completed. The branch of the Atchison, Topeka & Santa Fe from Socorro west to the Magdalena Mountains is 48 miles; the Denver & New Orleans, running through the northeast part of Colfax County, 100 miles, and the Texas, Santa Fe & Northern system, 743 miles.

IMPROVEMENT OF RIVERS AND HARBORS.

The report of Gen. Orlando M. Roe on the river and harbor improvements in the Detroit district has been received.

Improvement of the Detroit River.—The original project was for a curved channel 300 feet wide, with a uniform depth of 20 feet. During the past year a modification of the original project was reccommended to the Chief of Engineers, which would result in a straight channel of the same width and depth. The engineer says: "It is of great importance that this improvement should be prosecuted to early completion on the modified plan. If the amount of the estimate ($237,700) be appropriated in one sum, the cost will be materially lessened and beneficial results sooner available. The original estimate of the cost of the improvement was $1,666,500. There has been appropriated to date $335,000, and the amount required for the completion of the work is estimated at $237,000. During the past year 90,000 square feet were dredged and 6,534 cubic yards of solid rock removed. The engineer estimates that if Congress shall appropriate the amount asked for, 15 per cent. of the work will be saved, and it can be completed in two seasons. He reports that the commerce to be benefited is the largest that passes any point on any inland water channel in the United States.

Saginaw River and Harbor.—The project comprises dredging the Saginaw River from the head of navigation to Portsmouth bridge, at Bay City, to a depth of 12 feet and not less than 200 feet wide; in front of Bay City to a depth of 14 feet; across bar at the mouth of the river to a depth of 14 feet, and the construction of two cross-dams at Carrolton Bar and one at Ida channel. Total estimated cost of this project, $446,000 and the act of 1882 appropriated $125,000 for the work. During the past year $11,234 was expended in the completion of repairs, some minor examinations and surveys to obtain information for the Board of Engineers, completion of maps of survey of 1881 and in dredging operations under contract at Willow Island, at Bay City and at the mouth of the river. There had been appropriated for this work to July, 1881, $89,863, and since the adoption of the new project, $125,000 has been appropriated. It is estimated that $420,000 will be required for the completion of the existing project, in addition to the unexpected balance of $116,394 on hand July 1, 1883. The engineer recommends the appropriation of $200,000 for use next year.

Hay Lake Channel—Sault Ste. Marie River.—It was originally estimated that this improvement would cost $217,292. The act of 1882 appropriated $200,000 for prosecution of the work, and the engineer now says: "As the work, even with a large appropriation, will require some time for its completion, I earnestly recommend these be made as large as possible. The proposed improvement is of such a character that a very large force can be advantageously employed upon it. To this end the sum of $500,000 should be appropriated with which to begin the fiscal year 1884 and 1885. More than this could be used, but I deem it useless to to ask for more. It will be well to bear in mind no practical result need be expected until the entire improvement is completed, when the advantages to commerce will be great and manifest. A survey was begun during the year, and is now in progress, for obtaining the data necessary to make the project in detail for the entire improvement."

RAILROAD BUILDING IN WISCONSIN.—A fair amount of railroad construction is going on in Wisconsin. Beside the Western Extension of the Northwestern road from Princeton to Valley Junction, a distance of seventy-five miles, the Wisconsin Central will build a spar from Ashland east to the region of the iron mines, a distance of forty miles. The link from Superior City to Ashland is in process of construction, 1,000 men being employed upon it. The Milwaukee & Northern is pushing on into the lumbering and iron mining district, and the St. Paul & Eastern Grand Trunk Railway Company is in a fair way to complete its line from Oconto to St. Paul in the near future. Directors of the St. Paul & Chicago Short Line Railway Company have resolved to build a branch line to a point in Popin County, in a northeasterly direction, through a portion of Popin, Dunn, Eau Claire and Chippewa counties, a distance of sixty miles. The graders on the Lake Shore & Western Road have completed an extension directed toward the Lake Agogebie iron mining region for a distance of ten miles, and the balance of the extension will probably be finished this season.

Of branches completed during this season, the C. M. and St. Paul has the spur from Brandon to Markesan, a distance of fifteen miles, and the Chicago & Northwestern has built seventy miles of road from Eau Claire to Ashland. It is noticeable that the extensions and spurs are mainly located in the iron mining and lumbering regions of the State—regions which in the future will furnish the occasion for much railroad building and be productive of a vast amount of business.

RAILWAY SUPERVISION IN TEXAS.

An engineer of long experience in Texas, neither holding nor seeking State positions, and not desirous of newspaper prominence, allows the use of his views apropos of the organization of a State Engineer's Bureau, under the Gibson bill:

"What do you think of the wide scope of the Railroad bill and its variety of exactions?"

"The bill would be objectionable if it did not permit the State Engineer to give his suggestive views on the practical administration of its provisions, as well as to report mechanically in accordance with its requirements."

"I take it, then, that you detect possible improvements that could be made in the law?"

"I do, even now, and after I see the experience the State Engineer has under it, I warrant you further and further amendments will be suggested."

"As a whole, how do you regard the law as a guide?"

"My view of the office of State Engineer is that he should have his duties confined to the physical condition of the roads. The law requires differently. He must see that there is a good road, just freight rates, and no violations of the law. The law was framed by an able body, which, by the terms of its own bill, expected the State Engineer to help improve on it. If it was not for this spirit in the law the State Engineer should not, after he accepted the appointment, advance his own ideas as to wherein improvements could be made. If he accepted, he should do so with no questioning as to the completeness of the law."

"How is the engineer to get through with two complete inspections per year, as requires the law, of over 6,000 miles of road in the State, with the mileage increasing all the time, and what time should be consumed in each inspection?"

"His first trip will consume all of three months, steady moving. Where bridges are numerous and high, and where there is much trestling, he should not make over 50 miles a day, say. In cases where roads have good iron bridges, inspection is more rapid. The two regular trips per year, with the extra inspections deemed necessary by the engineer or by the Governor, will keep him at least half his time on the road."

"How does the freight agency part of the bill fit an engineer's talent?"

"There are but two men in the State, probably, who can prepare a 'complete freight classification schedule of reasonable maximum rates for freight transportation for each of the roads operated in the State,' as the law requires. However, it is the engineer's duty, and would consume at least two months of his time, and then he should submit his labor with misgivings."

"Do you not think an injustice is done a road when, on the State Engineer's report to the Attorney-General of some violation of law, suit is instituted without giving any longer than ten days' notice to the road? This is the present law."

"It seems so to me. There are cases where a road to remedy an evil would require at least ten days' time to satisfy itself by its own inspection. If the engineer is an autocrat to order changes and reforms, allowing no chance for a discussion of intelligent differences of professional opinion, then the bill invites no criticism."—*Galveston News.*

M. DE LESSEPS.

SOMETHING ABOUT HIS HOME LIFE AND HIS TEN CHILDREN.

(New York Tribune.)

M. de Lesseps returned in haste from London to see how his ninth child, Paul, was getting through a typhoid fever. This is the one fair-haired member of the family. He looks a youthful Hebrew of the German type, and does not resemble either father nor mother. Not one of the ten has a de Lesseps physiognomy. They are all, with the exception of numbers nine and ten, the pictures of Mme. de Lesseps. She is a Creole lady. The Mauritius was her birth place, and her parentage was Anglo-French. Benjamin is the name of the baby boy who is just ten days old. He was exhibited by the proud father to his visitors on the morning on which he told me of the negotiations which he had brought, as he believed, to a successful issue in England. The infant Benjamin was not more clothed than a Bambino in a Holy Family. He had on a little sleeveless garment of a soft, woolly sort of cotton, which did not, when he wanted to kick, restrain the action of his nether limbs. M. de Lesseps hates to see a finely dressed child. Nature, he says, does better for the infant in temperate and warm climates than the dressmaker's art can possibly do. She gives it an envelope of fatty tissue which keeps it warm, and the beauty of a fresh skin and graceful movements. He never suffered more clothing on any of his boys and girls than what the standard of decency required. Those little dressed up creatures with frills, sashes and knotted leggins, which make them seem first cousins to bantam fowls, positively grate upon his nerves.

M. de Lesseps asked his visitors to stay and take potluck with him at dejeuner. His two elder boys did not join at table the family party, which included Miss Pryse, a Welsh governess, and her French colleague, whose name I did not catch. M. de Lesseps had on his right hand and his left his daughters Solange and Consuelo. Solange is his favorite. Both girls' names were borrowed from romances of George Sand, and emotional character is more strongly expressed in their eyes than those of their other three sisters. Solange, though pretty big, is always caressing and leaning her head on her father's arm. She follows him about with her eyes, and, he says, pines when he is long absent from home. As she is delicate he is afraid to take her about with him, but has promised that when he next makes an excursion into the desert of Tunis she is to bear him company.

The dejeuner was extremely simple. There was a dish of spinach and poached eggs, followed by boiled potatoes in their skins, which (the potatoes, not the skins) were eaten with a little butter and powdered sugar. The plat-de-resistance was a mutton hash. I observed that the children who sat down to the repast were moderate eaters. M. de Lesseps seemed glad to hear me notice their sobriety. Here are some of the rules by which his nursery maids and governesses are bound:

"Little meat, less clothing, unlimited exercise; food to be given in the hand whenever it is asked for, but only twice a day at table. A child who plays while eating merely eats to appease hunger, and does not run into gluttony. A child who is only allowed to eat at fixed hours and at table hours is sure to gorge itself and take more than it requires."

M. de Lesseps preaches that the children of the rich are over-dressed, over-fed and under-exercised. He was brought up in many respects like a young savage—just as he is rearing his little folk—and he thinks that had it not been for his father's appreciation of the unadorned beauty of infants and dislike of finely clad and pampered babyhood he (M. de Lesseps) would not have preserved his vitality so far into age as he has done. The basis of a strong constitution was laid in a free and natural childhood. At the age of five he was no more afraid to ride a mettlesome horse than an Arab of the desert. Before his boys and girls were old enough to play marbles and dress dolls he gave them ponies and took them out to ride in the environs of Paris.

THE BRIDGE AT MINNEAPOLIS now building by the Manitoba Railroad is a magnificent stone arch across the falls to the Union Depot. This bridge was to be built in connection with a union depot to be centrally located, and which is to be erected on Bridge square. Meanwhile, preparations for building the bridge went on. Col. Smith, Chief Engineer of the Manitoba road, had charge of all preparations, and has succeeded in producing a structure which is one of the engineering wonders of the country. It is composed of 22 arches or spans, standing on 24 granite piers, the foundations of which rest many feet below the surface of the seething waters of the river. To dig these foundations took a great deal of money and engineering skill. Coffer dams had to be built and the water pumped out before the solid masonry could be laid, which would bid defiance to the swift current of the Father of Waters. Then great masses of stone had to be brought from Iowa, Kasota, Medina and Mankato, which skillful masons quickly converted into stable masonry. It commences on the east bank of the river, a few feet northwest of the lower bridge, and, curving, reaches the west band close to the pump house, a little above Sixth avenue south. Nearly 200 men are driving the work, the hours of labor commencing at 5 a.m. and lasting till darkness sets in. It will be finished by the 1st of November, and will be double-tracked before snow flies. So massive is it that trains will run over it at full speed without causing a vibration.

THE CANADIAN PACIFIC has been finished as far as Cargary. This concludes Langdon, Shepard & Co.'s contract of 674 miles, which extended from Oak Lake, sixty-five miles west of here, to Cargary. The main track is built 630 miles west of Winnipeg. The rapidity with which the road has been built is acknowledged by railway officials to be marvelous. Langdon, Shepard & Co. receive for their work over $4,000,000. Total cost to the Canadian Pacific Railway of constructing the line to Cargary from Oak Lake, over $10,000,000. Mr. Langdon, interviewed this morning about the work, said that it had been done rapidly, but with experience had in construction the firm now believe it could be done much faster. All men employed by this firm and all outfits used in construction have been taken over by the North American Railway Construction Company, which, under the superintendence of James Ross, will carry on the work to completion. Mr. Langdon says the firm has several small contracts in the States to go to work on—one at Devil's Lake, Dakota; another in Wisconsin, and a third in another State. Speaking of the construction of the road west of Cargary, through the Rocky Mountains, Mr. Langdon said he would stake his professional reputation that no man ever saw such a fine location for any railroad through a mountain range. The gradients are not high and the road could be drilled through the mountains with great facility. The line, he says, is located now about thirty miles beyond the summit of the mountains. When work this year is completed there will only be 280 miles of road to be built in order to connect with the line for Kamloops at the Columbia River. A large party of Irish immigrants, destined for Dakota, has arrived at Winnipeg.

"INJUN" AND "INJUNEER."—We find the following in a Western exchange, but, despite the gallantry and civility of the civil engineers, it is hardly necessary to say that the following does not refer to a member of the corps: "It is said that on a new branch of a Western road recently opened, the Indians have been in the habit each day of gathering at the station to see the trains arrive and depart. One passenger train goes each way each day, and they both stop at the station referred to. The squaws to the number of several are generally on hand, and one of the engineers who runs a train, and considers himself quite a masher, engages during the short stop with the best looking squaw while oiling his engine. The other day he stopped as usual, and engaged in conversation with quite a comely-looking squaw, having a papoose swung at her back. Thinking to please the mother, he said, pointing to the child, which was of a very light color, 'Little Injun?' She replied, apparently well pleased: "Yes; part Injun, part Injuneer."

THE BOZEMAN (MINN.) TUNNEL.—At present the railroad goes over the mountain. The tunnel is not completed, but is being pushed with great vigor. The railroad is of easy grade to the entrance of the tunnel on each side of the mountain, but from the portals of the tunnel over the mountain it is hard climbing, the grade being 4 ft. 7 in. to the 100 ft. of road. When the tunnel is completed this steep grade will be dispensed with. The tunnel is to be 3,650 ft. in length through hard rock. From the east portal it is driven in 1,560 ft., and from the west 700 ft., leaving but 1,390 ft. to be completed. At the rate it is now being driven it will be done about the 1st of December next. The opening into the mountain is 16 ft. wide and 21 ft. high—about 12 yards to the 1 ft. of tunnel. They use only three drills (engines) at a time, which are run by compressed air drives and make a one and a half inch hole into the rock, from eight to ten ft. deep in a remarkably short time. In this way, 210 ft. of tunnel was made last month in the east-end side. I doubt if the like work was ever done in a tunnel of that size in all hard rock work. Two large compressors run by steam produce the power for the drills at the headings, conveyed there through iron pipes, and are intelligently and energetically handled by men, masters of the power they control. Col. Murr, the contractor, a man of great energy, push and experience, gives the work daily his personal attention.

MISSISSIPPI RIVER IMPROVEMENTS.—Major O. E. Ernst, United States Engineer in charge of the improvement of the Mississippi River in the vicinity of St. Louis, has finished his report of work done during July. Owing to continued high water but little was accomplished during the month, and the subjoined synopsis will show the exact condition of affairs:

Carroll's Island—In the hurdle to connect the head of Carroll's Island with the Illinois shore sixty-four piles were driven, thirteen braces and twenty stringgers were placed, seventy-three linear feet of wattling was placed, and ninety linear feet of foundation mattress was fabricated and sunk.

Twin Hollows—In secondary hurdle No. 3 five piles were driven. In No. 4 the two cribs previously constructed, aggregating 190 feet in length, were sunk. In No. 5 the construction of a crib to be placed at the shore end was begun.

Chesley Island—In the hurdle to close the chute, west of the island, 102 piles were driven, 190 linear feet of foundation mattress was fabricated, of which 130 feet was sunk; 7 braces were placed, and 275 feet of wattling, averaging 14 feet in depth were placed.

Cahokia Chute—In hurdle No. 1, 135 piles were driven and 200 linear feet of foundation mattress was fabricated. In hurdle No. 2, 16 piles were driven, 44 braces placed, 40 linear feet of foundation mattress fabricated, and 402 linear feet of wattling, averaging 11 feet in depth, was placed.

Surveys—The gauges at Grafton and Gray's Point, on the Mississippi, and at Warsaw and Tuscumbia, on the Osage, were read daily.

CLEANING BLACK RIVER.—A letter from Poplar Bluff, Missouri, says E. C. Wiley, United States engineer, has been in the Bluff several days, making arrangements to commence cleaning out Black River. He has left with several hands for a point on the river below town, where the work was left off last year.

ENGINEERING NEWS
AND
AMERICAN CONTRACT JOURNAL.

Tribune Building, New York City.

The Engineering News Publishing Company, Proprietor.

Published Every Saturday.

CONDUCTED BY
GEO. H. FROST and D. McN. STAUFFER.

TERMS OF SUBSCRIPTION:
$4.00 ..... PER YEAR TO U. S. AND CANADA.
$5.00 ..... " " " FOREIGN COUNTRIES.
Make all drafts and cheques payable to ENGINEERING NEW PUBLISHING CO. Postal Money Orders, for convenience, may be made payable to GEO. H. FROST.

NOTICES OF MEETINGS.

AMERICAN INSTITUTE OF MINING ENGINEERS.

The Autumn meeting of the Institute will be held in Troy, N. Y., during the second week in October. This meeting will be mainly devoted to the reading and discussion of papers.

Members who wish their papers fully discussed at the meeting can have them printed and circulated in advance, if they are sent to the Secretary early in September.

THOMAS M. DROWN, Secretary.
R. W. HUNT, President, Troy, N. Y.

THE writer of the letter which was published in our issue of July 7, under the heading of "Railroading in Mexico," requests us to state that in the list of engineers on the Mexican Central the names of John H. Kain, Division Engineer, and C. M. Craig, Locating Engineer, were omitted as they were in the United States at the time, and he supposed had resigned, but they have recently returned to Mexico and resumed their respective positions.

THE PROPOSED TUNNELS OF THE HARRISBURG & WESTERN RAILROAD.

We are indebted to the courtesy of Thos. H. Loomis, of the above company, for the following data concerning the tunnels about to be let on the road mentioned above. The information will be useful to contractors and others wishing to visit the site of the works:

TUNNELS.

		Feet long.
Twins.	*Blue Ridge*. (Franklin Co., 44 miles west of Harrisburg; 14 miles west of Newville.)	4,350
Twins.	*Kittatinny Mountain*. (Franklin Co., 45 miles west of Harrisburg; 15 miles west of Newville.)	4,635
	Tuscarora Mountain. (Franklin and Huntingdon Counties, 56 miles west of Harrisburg; 3½ miles east of Burnt Cabins.)	5,400
	Sideling Hill. (Fulton Co., 74 miles west of Harrisburg; 17 miles east of Everett.)	6,700
	Rag's Hill. (Fulton and Bedford Counties, 79 miles west of Harrisburg; 12 miles east of Everett).	3,620
	Allegheny Mountain. (Somerset Co., 127 miles west of Harrisburg, 27 miles west of Bedford; 14½ miles east of Somerset.)	5,900
	Laurel Hill. (Somerset and Westmoreland Counties, 155 miles west of Harrisburg; 13½ miles west of Somerset.)	5,450

AMERICAN EXCAVATORS VS. FRENCH OPINIONS.

The letter of Messrs. Osgood & MacNaughton, in to-day's issue, in defense of the merits of American excavating plant, though hardly needed, is published with pleasure. In his criticism, the French author of our recently translated article on the Colon Division of the Panama Canal has only followed in the too usual rut of continental, and, we may say, English prejudice, in regarding all other than the production of their own engineers as mechanical failures.

The needs of our own widely-extended country, and the vast enterprises called forth by our public improvements, have nurtured and developed all machinery tending to reduce cost and hasten the completion of work in hand. That American inventors have always met the demands made upon their ingenuity goes without saying. The fame of our machinery is world-wide; and we can afford to disregard the individual opinions of an author biased by patriotism and prejudice. As we have before remarked, the French engineer regards the Panama Canal as a purely French enterprise, and is often disinclined to even give a fair trial to foreign machinery and contractors. That all French engineers are not so prejudiced we can mention the author of the canal scheme, De Lesseps himself, who has spoken most favorably of American aid in carrying out his plans, in the shape of capital, plant and contractors.

THE NEW CROTON AQUEDUCT.

In giving our report of the first meeting of the New Aqueduct Board, and describing the proposed work, we omitted mention of the engineers who designed the system suggested, and those to whom these designs were submitted for approval.

For more than two years past Mr. Isaac Newton, Chief-Engineer of the Croton Aqueduct, has been steadily at work on surveys on plans covering all the available routes from the Croton water shed. In this work he had the advice and counsel of Mr. E. S. Chesbrough, the Consulting Engineer of the Department, and the engineer of the first Boston aqueduct and the Chicago tunnel; the able assistance of Mr. Benjamin S. Church, for 26 years resident engineer in charge of the Croton aqueduct; and the aid of Mr. Julius W. Adams, Past President of the Amer. Soc. C. E., and an engineer of 40 years' experience in the design and construction of water-works and other important engineering enterprises.

When the investigation had sufficiently advanced to permit the preparation of what was deemed the best plan, this plan was submitted to the following well-known engineers: John B. Jervis, James B. Francis and Robert K. Martin. The fitness of these gentlemen for their task none can deny; all of them brought to the subject the accumulated knowledge of years of professional experience. Each member of the board separately examined the proposed scheme, and all combined in approving the Department plan.

The last-named gentlemen, in conjunction with Gen. Goe. S. Greene, also examined into the question of storage, and concurred in the report made thereon by Mr. Newton, Feb. 21, 1883, to the committee on additional water supply.

PERSONAL.

MR. B. S. CHURCH has been appointed engineer to the Croton Aqueduct Commission. The salary is to be appointed later.

MR. JOSEPH RAMSEY, late General Manager and Chief Engineer of the Pittsburgh, Chartiers & Youghiogheny Railroad, has left that service.

HENRY HARDING, late Chief Assistant Engineer on the Eastern Railroad, has resigned his position and opened an office as Consulting Engineer in Salem, Mass.

COL. F. C. ARMS, of Carlisle, Pa., well known in Pittsfield, Mass., where he was a frequent visitor, died in Carlisle, Monday, of apoplexy, at the age of 68 years. He was a native of Conway, Mass., was a civil engineer by profession, and during the latter portion of his life he was engaged in building railroads in the South.

PROFESSOR J. B. JOHNSON, United States Assistant Engineer, has been appointed to the William Palm professorship of civil engineering in Washington University, St Louis. Mr. JOHNSON is a graduate of Michigan University, which he attended after several years' experience as a teacher. After taking the degree of Civil Engineer, he took part for some time in the various operations of the Lake Survey, under Gen. COMSTOCK. During the last two or three years he has been in the employ of the Mississippi River Commission. His latest work has been the completion of a line of "precise levels" from the Gulf of Mexico to Chicago, by way of the Mississippi River, through Keokuk and across the State of Illinois. The difference in level between a certain bench mark in Chicago and mean water level at New York City had already been determined by the Lake Survey. The difference between the Gulf level and the same bench mark is soon to be determined by the completion of Prof. JOHNSON'S work. It will be interesting to compare the two results. A disagreement of less than a foot is expected. Mr. JOHNSON will enter upon the duties of his professorship at the beginning of the next scholastic year, on the 13th of September.

CORRESPONDENCE.

ALBANY, N. Y., Aug. 11, 1883.

Editor Engineering News:

We have read with great interest the translation which appeared in ENGINEERING NEWS of Aug. 4, of the article from Le Génie Civil on the "Colon Section of the Panama Canal."

We do not know the name of the gentleman who wrote that article, but we deem him worthy of all praise for the fire of patriotism which seems to consume him, while we are constrained at the same time to protest against some of his statements as being not in harmony with facts. We are willing, however, to make due allowances for the statements of a man evidently so jaundiced by prejudice that he cannot see any good in anything which is not French. He reminds one of the ancient Greeks who looked upon all nationalities except their own, as barbarians, beneath their notice except for purposes of conquest and the levying of tribute.

The complacency with which this gentleman lauds everything and every one from France, and ridicules and belittles everything and every one from the United States, would be amusing were it not quite so wholesale. In his opinion, apparently, Americans know very little about conducting the execution of large public works, are ignorant of the best means of excavating and handling large quantities of earth, and incompetent to design and manufacture a plant for this purpose. An arraignment of American skill in this field of labor is intensely amusing, and illustrates fully the splenetic disposition of the author of the article.

If we have a right to be proud of anything, as a nation, in the field of enterprise, it is unquestionably in the inception, elaboration and completion of large public works.

For over a hundred years we have been waging a prolonged warfare against the obstacles which nature has placed in the path of our progress toward opening up immense and imperial landed possessions. The most important among the arms employed in this civilized warfare have been large and successful plants for dredging and excavating.

In river and harbor work, in the construction of thousands of miles of railways, in the completion of many aqueducts and other public works, all built in an incredibly short space of time, we have demonstrated to the world our superiority in this class of work. The low comparative cost of these works demonstrates our superiority in labor-saving appliances, in a country where labor is uncommonly well paid.

How have we been able to produce these results? By the employment of admirable machinery, first and most important of which were dredges and excavators.

And yet this gentleman would make it appear that we Americans are deficient in ability in this line of effort. We can well afford to smile at him and to deal gently with him in his consuming admiration for all things which come from La Belle France.

To one part of his report we desire to call particular attention, as it is likely to injure the reputation of two manufacturing firms in this country, "quorum magna pars fui."

On page 368 of your paper, Aug. 4, in third column, are the following words:

"At the commencement of 1883 the plant a Monkey Hill included two Couvreux excavators, two American excavators and several picking machines. All of this machinery was not at work at one time. The American machines, among others, have proven that they are not capable of regular and continuous work."

We beg leave to differ with the latter part of this extract and to say most emphatically that the American excavators have proven nothing of the kind. We can make good our assertions to the satisfaction of any impartial judge.

Of the two American excavators alluded to, one was an Osgood & MacNaughton machine, the other an Otis, or Souther, excavator, manufactured by John Souther & Co., of Boston.

Although Souther & Co. are our competitors in business we cheerfully recognize the good reputation which their excavators have justly borne in this country for the past twenty or thirty years. They have been widely used on all kinds of work and, during that time, there has hardly been a railroad of any considerable length, which has not been indebted to an Otis, or Souther, machine for some part of its excavation.

For our own machines we will let others speak rather than ourselves. Suffice it to say that for the past thirty years we have made a specialty of the manufacture and the operation of dredging and excavating machines. As evidence that we have made a success with our designs, we will only say that, besides having manufactured for a great many private firms, we have built a large number for the United States Government, Canal Dep't. of State of New York, the Chinese and the Mexican Governments, the Harbor Commission of Montreal, the Department of Docks, New York City, etc. Invariably our machines have merited and have received the approval of the parties operating them. We have many commendatory letters in this regard. It remained, however, for the author of this article to discover that ours, in common with other American machines, were incapable of regular and continuous work!

We insist that he does not state the case fairly as to the operation of our machines at Panama. We present a copy of a letter from Mr. Albert Millet, C. E., which serves to show that a far different opinion from that stated by him prevailed at Panama among those who have used these American machines.

Mr. Millet was formerly employed as engineer by the Canal Company, and is very highly thought of. Afterward he was given the contract for excavating the most difficult part of the work, the Culebra section of the canal. He is a South American by birth, a practical contractor and an educated engineer, being a graduate of the Polytechnic Institute at Troy, N. Y. His opinion is entitled to respect and attention.

COPY OF MR. MILLET'S LETTER.

NEW YORK, July 31, 1883.

Messrs. Osgood & MacNaughton:

GENTLEMEN: Mr. Clark has asked me to give you a written opinion of your steam shovels, which were started some months ago on the Culebra section of the Panama Canal.

I do so the more willingly that I notice in Lieut. Rogers' report that during his stay on the Isthmus he was told in Colon that the Souther excavator was preferred to yours. This is somewhat unfair to your machines, for every one there knows that the American excavators at Monkey Hill had very little chance to show what they could do.

In Culebra I was able to form a pretty correct opinion of your excavator. It repeatedly filled a four-cubic metre dump car in a minute and a half, the same performance which was accredited to the Souther machine.

The handling of your steam shovel is extremely simple. I take it to be simpler than in any other shovel. This is a great desideratum.

On the whole, I like your machines exceedingly, and will always use them when I have a chance to do so. They will show later their merits on the Panama Canal, and, if given fair play, will dispel all the prejudice which may at one time have been shown against them by engineers on the Isthmus.

Yours, very truly, ALBERT MILLET.

We would say further that one of our excavators was tried first, as an experiment, and that very shortly afterward eight more were ordered from us and have been at work on the Isthmus. Of these, six have been at work on the Culebra section. This would hardly indicate that they were incapable of regular and continuous work.

We must ask your pardon for occupying so much of your space and for saying so much about our own products. We have been impelled to make these statements, not merely for our own sake, but in defense of American manufacturers and contractors at large whom this amiable Frenchman seem to arraign as incompetent. We wish to show that in one part of his report his statements are grossly inaccurate, to say the least. Very respectfully yours,

OSGOOD & MACNAUGHTON.

NEWS OF THE WEEK.

PHILADELPHIA WATER-WORKS.—Chief Engineer Ludlow, in a communication to the City Comptroller, dated August 15, says: "The estimated amount required for the maintenance, improvement and extension of the operations of this department during the year 1884 is two millions ($2,000,000) of dollars and the receipts are estimated at one and a half ($1,500,000) millions. The estimates cover a certain amount of pipe laying, to replace mains less than four inches in diameter, and the cost of certain large mains imperatively required for the improvement of the distribution. They also include the amounts that can be advantageously expended upon the East Park, Cambria and Mt. Airy reservoirs, but are exclusive of the land damages in the two last named, which have not yet been assessed."

THE VANDERBILT TUNNELS.—There will be seven tunnels with an aggregate length of seven miles on the proposed Vanderbilt R. R. between Harrisburg and the West. The estimated cost of this road is $20,000,000, or about $100,000 per mile.

THE BEE LINE.—It is stated on pretty reliable authority that this road is pretty sure to be built, and that the operations will be commenced as soon as General Devereaux and party return to New York from St. Louis and have a consultation with other parties concerned.

THE COLUMBUS & EASTERN RAILROAD is to be ready Oct. 1. It will be laid with steel rails, and is already graded from Glenford to Roseville. The road will run to Malta, which is across the river from McConnellsville, and may eventually run down the Muskingum Valley to Marietta. It will not be built further than the Buckeye Valley coal region by October, but will reach the Muskingum River early in the winter.

THE EVANSVILLE, LOUISVILLE & ST. LOUIS AIR LINE has been leased, it is reported, to the Evansville & Terre Haute. A new bridge is to be built across the Ohio at New Albany.

THE ENGINEERS engaged in surveying and staking out the lines over which the proposed Topeka & Ottawa railroad is to be built, have finished their work in Lawrence County, Kan. The line, as laid out, runs about a mile north of Twin Mound and crosses the Wakarusa River at the Richland bridge.

A RAILROAD INCIDENT.—At a station on the Michigan Central Road near Kalamazoo, the other day, a strapping youth boarded the train, leading by the hand a blushing rustic maid. Taking his stand in full view of every body, he orated: "Ladies and gentlemen, this is my wife, Mrs. Heuffer; ain't she a daisy?" He proudly exhibited his prize to the amused observers through a fifty-mile ride with an exemplification of the enticements he had used to win her. Arrived at Buchanan, the happy pair alighted in the presence of a large crowd assembled to greet them. Again the groom announced: "Ladies and gents, my wife. Ain't she a darling?" Bystanders and passengers united in greeting them with cheers and the waving of handkerchiefs.

RAILROAD BUILDING is brisk at Wichita, Kansas. The Atchison, Topeka & Santa Fe Company has a large force of men on the grade west of the Arkansas River. The right of way to the western line of Sedgwick County has already been condemned. The agents of the St. Louis, Fort Scott & Wichita Railroad Company are holding meetings in Western Sedgwick, working up a subsidy for that road. It is rumored here that both lines will be extended to Kingman immediately.

THE DAKOTA & GREAT SOUTHERN a new railroad company, has purchased the franchise of the Milbank, Kibby & Tower City Railroad Company, and will commence at once building an independent road from Tower City south to Sioux City and St. Louis, and north to the Manitoba line. One hundred and fifty miles will be graded this season, and the entire line completed in October, 1884.

NEW PARKS FOR NEW YORK.—The Commissioners appointed by Mayor Edson last Spring to locate parks in the Twenty-third and Twenty-fourth Wards have been engaged for the last two months looking over the ground and considering various plans suggested by private citizens and the Park Commissioners. A public meeting will be held soon on the subject.

LABOR IN CALIFORNIA.—The condition of the wage-earning class has seldom been more satisfactory than at present. There is work for all, at good figures. Wages show a material advance over those paid a year ago, while the cost of living is not much greater than it was. The indications, however, are that a more positive rise will take place in this direction also. Many articles of food show already an advance, especially meats, while fruits and vegetables, which have always been abundant and cheap at this time of the year, have continued scarce and high. Just now wages are certainly a little inflated, because there is an absolute scarcity of labor in certain branches of industry. A singular point in connection with this subject is that the loss of Chinese cheap labor, occasioned by the stoppage of the immigration, does not seem to be felt, except, perhaps, in certain manufacturing branches. So far no one seems to have seriously missed the coolie.

IRON STAIRS FOR CUSTOM-HOUSE AT CINCINNATI.—The following is an synopsis of bids for iron stairs for the custom-house, etc., at Cincinnati, O.:

The Snead & Co. Iron Works, $7,148.
The Phœnix Iron Company, Trenton, $7,482.
Joseph Hall & Co., $7,654.
Bartlett, Hayward & Co., $7,900.
Haugh, Ketcham & Co., $7,961.12.
Scherpe & Koken, $8,500.
McHose & Lyon, $9,000.
M. Clements, $7,885, informal.

The bid of the Snead & Co. Iron Works, $7,148, the lowest, has been accepted.

THE EMERSON LOOP LINE ON THE CANADA PACIFIC is graded. Major Bowles, contractor for the masonry of the bridge across the Red River at Emerson, says he will have the pivot pier completed in ten days. Messrs. Dean & Westbrook, contractors for the superstructure, state that the iron work is now on the way and expected to arrive next week. They expect to have the bridge ready for traffic by Sept. 20. It is believed the entire loop line will be ready for operation by the first of October.

PORT ARTHUR (MANITOBA) is to have another railroad. The Thunder Bay Colonization Railway Company is applying for a charter to run a line of railway from some point on Thunder Bay to connect with the Duluth & Iron Range Railway, which is at present under construction, and is contracted to be completed in August of next year.

THE GRADE OF THE CANADA PACIFIC between Lake Superior and the Rocky Mountains will not exceed 52 ft. to the mile, and on the greater portion of the section will not exceed 40 ft. per mile From Winnipeg eastward to Thunder Bay the maximum is only 26 ft. The line between Winnipeg and the foothills of the Rocky Mountains, 900 miles, traverses a fine agricultural region. Coal is found to underlie a very large area, and mines have been opened through some localities.

A VIADUCT OVER THE PLATTE RIVER.—The project for building a viaduct across the Platte to North Denver has been asleep for a season, but it is far from being abandoned. The subject was revived at the last regular meeting of the City Council by Alderman Bandhauer, who introduced a resolution instructing the Mayor to confer with the railroad companies and call their attention to the provisions of the ordinance, with a request that they commence their part of the work as soon as possible.

A NEW CANADIAN RAILROAD is to be built by the Temperance Colonization Company. The new railroad will start from some point on the C. P. R. in the neighborhood of Regina and Moosejaw, reaching Saskatoon within the limits of the colony, and be carried thence to Battleford or Prince Albert, or to both places. Operations are to commence at once. It is expected that the road to Saskatoon will be in operation by October, 1884.

RAILROAD BUILDING IN COLORADO.—Both the Union Pacific and the Burlington & Missouri have lines located up the Poudre cañon, and it was thought once that another railroad war equal to that over the right of way through the Arkansas cañon would be the result. The Burlington & Missouri, however, withdrew their surveyors and located another line by the way of Lone Pine creek, and obtained an easy grade. The Poudre cañon route the West, however, is acknowledged by both roads to be the shortest and most feasible, and considerable difficulty will yet be encountered between the rival corporations. The Union Pacific has graded some thirty miles up the cañon, tunneling and doing considerable work at a great expense, and they say they are going on through and make this their main line to the West. By this arrangement the Omaha short line will be utilized with the Greeley, Salt Lake & Pacific, the two roads meeting at La Salle, about five miles below Greeley, and a through trunk line will be the result.

But the Burlington & Missouri are not inactive, and are watching every move made by the Union Pacific. Each road is eager to extend its lines over both North and Middle parks. By so doing they would have the more feasible route to the West.

THE FLORIDA RAILROADS will have freight enough—at least in fruit and vegetables. "A gentleman from Florida thinks that all the railroads projected in that State will pay. 'Florida,' he says, 'is rapidly becoming the truck garden of America, and in no other States are there lands that will produce the weight of freight per acre. Take Georgia. The cotton lands demand only one car per season to every sixty acres cultivated, counting thirty bales to the car, and a bale to every two acres. At Harris' Grove, in Florida, the demand for his eighty acres was for eighty cars, and Harris says that in five years the same eighty acres will call for 160 cars. This is from oranges alone.

From vegetables the demand will be nearly as great, and the vegetables may be grown between the rows of trees upon the orange land. A lady assured me that she had produced from one acre of land tomatoes that had netted her $690.

THE COLUMBUS & CINCINNATI MIDLAND RAILROAD is now located as far as Wilmington (Ohio), the corps of engineers having arrived there August 10.

THE GULF, COLORADO & SANTA FE line has not yet taken any practical shape. Mr. Banks, the locating engineer, arrived at Dallas some days ago from Galveston. It is proposed to extend the line northeast, with Fort Smith as a terminus.

A NEW FLORIDA RAILROAD.—Notice is given of the incorporation of the Jacksonville & Atlantic R. R., to run from a point on the St. John's River, opposite the city of Jacksonville, to a point on the Atlantic coast at "section 33, in township 2. south, Range 29 East."

LEAVENWORTH (KAN.) WATER-WORKS AND SEWERAGE.—The recently completed water-works are proving themselves of more importance than at first anticipated; they were started in February last, and the revenue from consumers is already as great as the amount received in the third year of the operation of the Kansas City works near by. G. W. Pearsons, the engineer of the water-works, is making plans for the sewerage of the city, which will be on the separate system as far as practicable; about two miles of main sewers are already contract, and a number of district sewers are called for.

RAILROAD BUILDING IN INDIANA.—A railroad from Mitchell to Indianapolis is proposed. The Evansville, Washington & Brazil line will be begun at once. The Indianapolis, Eel River & Vincennes Railroad contracts will be let at once.

THE Atchafalaya Bridge is being rapidly built. Two of the five piers are completed. All the contracts have been let.

PRESENTING A WATCH.—The engineering department of the Pittsburgh, McKeesport & Youghiogheny Railroad on Wednesday presented Chief Engineer Wainwright with a handsome gold watch. P. F. Brendlinger made the presentation speech, and here is the way they do such things in a railroad office:

Brendlinger: Here is a watch.
Wainwright: Is this a watch?
Brendlinger: It is.
Wainwright: Thanks.

AN OLD BRIDGE.—An interesting relic of antiquity was lately received at Berlin from Mayence, consisting of the remains of piles belonging to the bridge which once led from Castel to Mayence, and which is supposed to have been in use some fifty-three years before the Christian era. The pieces of wood are trunks of various trees, including oak, elm and white and red beech. They are said to be internally sound, and to have pieces of iron at one end.

THE MOBILE & NORTHWESTERN is to be extended northward to Memphis.

THE MEXICAN CENTRAL RAILWAY earnings are again increasing. For the third week in July they amounted to $24,503.33 as against $14,807.64 for the second week and $10,894.60 for the first. The subsidy received by the road up to the present time amounts to $1,498,198.41.

THE NEW ORLEANS & MISSISSIPPI VALLEY ROAD is now laid for 130 miles between New Orleans and Memphis. The track is being laid from each terminus.

THE ST. LOUIS, EMPORIA & WESTERN road has been surveyed by Engineer Emerson as far as Rich Hill, Mo.

PROJECTED NEW RAILROAD.—HARRISBURG, Aug. 9.—Application is made for the Harrisburg & Southwestern Railroad Company, capital $5,000,000, the road to be 90 miles long, through Dauphin, Cumberland and Franklin counties.

THE CONTRACT FOR LIBERTY'S FOUNDATION.—The American Committee for the Construction of the Statue of Liberty awarded, Aug. 14, the contract for laying the foundation for the statue to F. Hopkinson Smith for $3.94 per cubic yard of concrete, the committee to furnish the cement. There were eleven other bids, the lowest of which was Mr. Ed. N. Lynch's. Mr. Lynch says his offer was $3.37 per cubic yard. Mr. Lynch complains that he offered good security, and was not fairly treated. Gen. Charles S. Stone, the engineer of the work, said: "The committee gave the contract to Mr. Smith because, after careful consideration, they were satisfied he was the safest and most advantageous person to do the work. Mr. Smith allows us to have the use of the structures he will erect for moving his materials after he has done with them. That is a great advantage to us."

TELEGRAPH LINE IN CHINA.—Since the destruction of the short railroad from Shanghai to Wusung by the Chinese shortly after its building in 1877, it has been thought that there would be opposition to further introduction of foreign contrivances; and two years ago, when the construction of a telegraph line was begun between Shanghai and Tientsin, a party of soldiers was detailed to guard the foreign engineers employed on it. The caution proved unnecessary; and the chief difficulties encountered were the numerous canals, some of which had to be crossed by cables. The want of good roads was a serious embarrassment when the line ran at a distance from the grand canal. The line is 988 miles in length, and required nearly 20,000 poles. The construction was begun in June, 1881, at the two termini, and in December was opened to public use.

THE FARGO & ST. LOUIS R. R. has been graded from Fargo to Wahpeton, twenty-five miles, and the work is being rushed forward at the rate of from three to four miles a day south along the Bois de Scout, which will be crossed some fifteen or twenty miles below Wahpeton. From Fargo to Ortonville, Minnesota, the line will be built and equipped this season.

THE ATLANTIC & PACIFIC R. R. was formally opened on August 10. This opens up another route to the Pacific Coast, via Albuquerque, Wingate, New Mexico and Winslow, Arizona.

A NEW BRIDGE CO.—The Sault Ste. Marie Bridge Co. was incorporated in Canada, July 2, 1883, with an authorized capital of $1,000,000. The company headquarters are in Toronto.

BRIDGE CONTRACT LET.—The contract for building the bridge across the Mississippi River at Little Falls has been let to the Milwaukee Bridge & Iron Works for $21,350. The bridge will be of the wrought iron combination style, and will have two spans each 197½ ft. long, and the single pier will rise 21 ft. above the present water level. Work will begin at once, and the bridge will be completed by November 15.

DEATH OF THE MAN WHO INVENTED THE STEAM WHISTLE.—This much-abused man died recently in Montreal. Henry C. Buckley was his name, and for many years he was foreman in the pattern shop of Trask's Car and Locomotive Works at Springfield, Mass. He made the patterns for one of the first locomotives used on the Boston & Albany R. R.

NEW PENNSYLVANIA FREIGHT SHEDS IN PHILADELPHIA, PENNSYLVANIA. — The Pennsylvania Railroad Co. contemplates the erection of an extensive freight station in Philadelphia on Delaware avenue, below Vine street. Two piers have been purchased, upon which the building will be erected. Sidings will be run in from the river front railway, and freight cars will be brought there on floats, so that freight can be received or shipped to all parts of the Pennsylvania system on either side of the river.

THE KANSAS CITY ENGINEERS' CLUB, which was recently organized, holds its regular meetings on the last Saturday of each month, and held its second meeting on Saturday evening, Aug. 4, and elected eight new members, among whom were some of the most well-known engineers of the county. The membership now comprises 19 names.

WATER AND GAS IN DULUTH (MINN.) are now to be had the entire length of Superior street.

THE Miami Valley road will be extended from Piqua to Troy, in Miami County, O., by the Chicago, St. Louis & Pittsburgh Company, which has purchased all the franchises, etc. Surveys have been made. It is also thought that the Panhandle will build a new line of road from Xenia, through Troy, Xenia and Minster to Fort Wayne.

A RAILWAY CONTRACT.—MINDEN, La., Aug. 8.—The contract for grading the Minden Railroad Tap was to-day signed by the directors and J. C. Hutchins, a well-known and reliable contractor. Work will commence in ten days and be pushed forward rapidly.

WORK AT VICKSBURG HARBOR.—VICKSBURG, August 14.—Col. Rittenhouse Moore, of the dredge-boat Herndon which has been busy operating on our harbor for the past six months, with a view to restoring to Vicksburg a navigable channel, departed by the Arkansas City for Wilson's Point this morning for the purpose of interviewing Capt. Marshall relative to his absolute failure to make the work through West Pass a success. The dredge-boat has been at work on the West Pass fully two weeks, but owing to the sand and seipage, the latter of which averages about 20 inches in every twenty-four hours, Col. Moore believes it would be a waste of time and money to continue work at this point further.

THE ST. LOUIS NARROW GAUGE interest has been purchased by the St. Louis Créve Cœur & St. Charles railroad for $216,000. Locating engineers are now in the field along the indicated routes, and unless some unforeseen difficulty is encountered in procuring the right of way, Mr. Colburn anticipates that the line will be in full operation to Créve Cœur Lake by next spring, as it is intended when once the construction work is commenced to push it with all the force money can command.

THE ST. LOUIS EXPOSITION.—Contract bids were to be opened on Friday, and the contractor expected to break ground on Monday. The contractors for the excavation will begin on Monday, and from that day forward there will not be a moment lost, except on Sunday. They will get under headway in two weeks, and by that time they will be so far advanced that they can keep ahead of the stonemasons, who will step in behind them and commence laying the foundations.

"This is somewhat different from an ordinary building," said the Superintendent. "In the first place we are not cramped for space or money. We can put a whole army of men in the center of the square, and can also use this space for storing material. The money will be ready for the contractors, and when they discover that the payments are waiting for them they will put every available man they can engage to work."

NEW SPANS FOR MACOMB'S DAM BRIDGE.—The Park Commissioners are making arrangements with a firm of iron manufacturers at Buffalo to provide three new iron spans for Macomb's Dam Bridge over the Harlem River. The Commissioners propose to keep the roadway open for travel during the performance of the work. When the old wooden spans have been taken out and replaced by the new iron ones, the bridge, it is claimed, will be as good as new. The cost of the work is to be $26,000, which was the lowest bid received by the Commissioners.

THE CANADIAN PACIFIC engineers are in Manitoba. A letter from Edmonton says: Our prospects of a branch of the C. P. R. are brightening. Professor A. C. Kenaston, an engineer of the C. P. R. exploratory staff, accompanied by Walpole Rolland, C. E., and Mr. Courtenay, of the C. P. R. land department, and several assistants, with an outfit of three saddle-horses and three mule teams with light wagons. They left the C. P. R. track at Swift Current about the end of April, and traveled by way of Sounding and Sullivan's lakes and Whitford's crossing of the Battle River. Their progress was slow, as they frequently camped for several days in the same place, making exploratory excursions on horseback in every direction. After coming to Edmonton for their mail, they returned to the Calgary crossing of the Red Deer, where they spent several days in exploring, and then came back to Edmonton. During the second visit Mr. Rolland made several sketches, and took over a dozen photos of the place. Then they set out on their return journey by the north side of the Saskatchewan, keeping as far back from the river as possible, so as to get a better view of the land.

CAPTAIN EADS has thus far received $4,800,000 for his work at the mouth of the Mississippi.

WASTE OF STEEL PENS.—A German technological journal points out the fact that a vast amount of valuable steel is lost every year in the shape of pens that become unfit for writing and are thrown away. Pens are made of the very finest steel, and can be remelted and used again for many purposes. They can be turned into watch springs and knife blades, and can be dissolved and made available in the manufacture of ink. The suggestion is made that the children of the poor should be taught to collect cast-away pens, and thereby save valuable material and earn money.

RAILWAY BUILDING IN FLORIDA.—The work of extending the road from Kissimmee City to Tampa is progressing very rapidly. Most of the grading to Lowry Lake, in Polk County, about twenty-five miles in a direct line from Kissimmee, has been finished, and the next move of the camp of Morgan & Reynolds, with which I am connected, will be to the neighborhood of Lake Medora, the point selected for the crossing of this road and the Jacksonville, Tampa & Key West road. The cross-tie contractors are also busy, and the pile-drivers are working steadily on the bridges through the swamps. It is expected that the work of laying the iron on this end of the line will be commenced about the middle of next month, and will be pushed forward as rapidly as possible.

THE BROOKLYN BRIDGE.—Several experiments with the cables have been made. The auxilary rope has worked perfectly. Colonel Paine, whose invention it is, was very much gratified with the result of the trial. But for some work that was going on in the middle of the bridge a car would have been run over from Brooklyn. When asked about the opening of the road for travel, Colonel Paine said, with a cautious shake of the head, "It is not too late yet for us to meet with impediments, though we don't expect them."

ENGINEERING EXHIBITION, LONDON.—Messrs. W. Marshall & Co., iron and steel manufacturers and contractors to the British government, of Grove street, Smithwick, near Birmingham, exhibited at the Engineering Exhibition samples of iron and steel of a description specially suitable for all high class machinery, for guns and rifles, and for every purpose in which uniform strength and freedom from flaws and specks is required, when turned up bright. The samples consisted of bars of various sizes, from 2½ in. diameter down to three-eighths

of an inch square. The round bars have been turned up bright for a portion of their length, for the purpose of showing their freedom from flaws and specks. Some of the square bars have been twisted into fine spiral forms from end to end at one heat. Others have had large holes punched through them in opposite directions, and have also been beaten out flat in opposite directions while hot. Other square bars have been bent double while cold, and others also twisted while cold into a fine spiral form. These samples were thus dealt with in order to illustrate the uniform strength and great toughness of this special make of iron, not only while hot, but also in the cold state. The firm of Messrs. Marshall & Co. has always been in the van of gun barrel manufacturing. It was established in 1855 and has ever since been identified with the progress of the industry.

THE New York, Texas & Mexican Engineer Corps, under Major N. R. Olcott, have been instructed to run another line from Rosenberg Junction to Houston. It is said the management have determined to build this road to Houston, and the only question remaining is to determine the most practical route.

THE LEBANON & BOLIVAR.—Work has been resumed on this road. Messrs. Faulkner & Diffendorfer, of Lebanon, who have the contract to complete the road from there to Buffalo, with a force of men, left for Brush Creek, where work was commenced. Their machinery and tools for rapid construction have been shipped from Arkansas to that point.

THE WINSTON BROTHERS, contractors on the Northern Pacific, are running a race in track-laying from the opposite end.

WALNUT (KANSAS) WATER-WORKS will be completed in a few days. In the southwestern part of the city of Walnut there are a number of never-failing springs, supplying thousands of barrels of fresh pure water each day. Reservoirs have been built to hold and retain this water; first there is a large receiving reservoir, out of which it is filtered into a second basin, the two holding probably half a million barrels. At the second reservoir an engine and pumping machinery will be stationed and pipes laid through the city of Walnut to the high grounds northeast, where a third or supply reservoir is being constructed. The plans of the work is a combination of the forcepump and reservoir systems, the pumps supplying the town and fire pressure, while the water is being worked into the supply basin on the hill, which is higher than any ordinary four-story building.

THE ST. LOUIS WATER SUPPLY.—The Mayor has issued an address to the citizens with regard to the new pump main.

GEN. PALMER'S resignation of the Denver & Rio Grande road is thus commented on by the Denver *Times*: "If the resignation of the presidency of the Denver & Rio Grande Railroad by General Palmer meaus that he is to retire from the railroad altogether and from railroading in Colorado, the event cannot be regarded as less than a calamity to the State. There are few such men in the country as General Palmer. The West has never developed a man who has been soperfectly a representative man as he. He has a Napoleonic genius for railroad building. Beginning less than a dozen years ago to construct a railroad to—to any place which might happen to need it—without capital, in a new, barren and sparsely settled country, he has extended the Rio Grande nearly seventeen hundred miles through the deep canons and over the high mountains throughout Western Colorado, Northern New Mexico and to the City of Zion, to the shore of the Great Salt Lake. It is safe to say that there is not another railroad in the world so long as this such a proportion of which has had so many difficulties in the way of natural obstacles to contend against. Ten years ago Veta pass was considered an impenetrable barrier to railroad progress. But that steep hillside was triumphantly ascended by Palmer's narrow-gauge engines, which within the past five years have penetrated the Grand canon of the Arkansas, gone booming through Toltec gorge, and passing over the Continental divide and through the terrible Black canon, have found their way—a way which man never trod before the railroaders came—to the uttermost bounds of the State.

ST. LOUIS' PROPOSED CONDUIT, ETC.—The Board of Public Improvements has given in a report recommending that the low-service engines be transferred to the Chain of Rocks. The report states that the necessity of locating the river engines at the Chain of Rocks will require the construction of a conduit from Bissell's Point to the Chain, to bring the water to the high-service engines. This conduit will be about seven miles in length and should be built of a capacity to furnish 80,000,000 of gallons per day. The cost of erecting a river tower, engine foundations and settling basins at the Chain will, however, be less than they were at Bissell's Point, on account of the better ground for foundation. Before this work is completed the present low-service engines will fall short of keeping up the supply. The progress of granite reconstruction is also referred to, from which it appears that over two miles of granite paving have been laid during the year, and five and one-half miles are now under contract and will be completed by next November. Ordinances are now in force authorizing other contracts for fourteen and one-half miles of this pavement, and when these are executed the city will have twenty-two miles of granite streets, the total cost of which is estimated at $1,710,243.73. Nearly all the streets between Poplar street and Franklin avenue and Twelfth street and the river are being reconstructed, while the work of reconstructing Locust street from Seventeenth street to Grand avenue, with asphaltum, is progressing favorably. The work of reconstructing Olive street, from the river to Grand avenue, has also commenced.

THE LOUISIANA LEVEES.—A meeting of delegates was held at New Orleans, on Aug. 13. It was stated that contracts had lately been let to close the Ashton and Morganza crevasses, and work on them is to be commenced by the 1st of September and finished by the 1st of January, 1884. Work in Arkansas to close gaps that have for years been pouring the floods from above on Tensas Valley is progressing favorably, and only $30,000 is needed as a contribution from Louisiana, to insure the completion of a work so valuable to the State. The Ashton and Morganza levees are to be built from the levee and drainage fund, while the regular levee work is to be paid for out of the regular levee tax fund and the special parish funds.

RICHMOND, Va., Aug. 6, 1883.

To the Editor of the Railroad Gazette:

FORMULA FOR FROGS.—Frogs are not always to be fixed by the useful rule, "Twice frog number into gauge." This applies only when main track is straight.

When the main track is curved, the following general formula applies.

g = gauge, d = diameter of curve of turnout, d n = that of main track, x = distance from heel of switch to point of frog measured on same main track rail as that on which frog is to be placed. Then

$$x = \left(\frac{g\,d\,n}{n \pm 1}\right)^{\frac{1}{2}}$$

Let $g = 4.7$, then

$$x = 2.17\sqrt{\frac{d\,n}{n \pm 1}}$$

Example.—Turning away from main track curve: Let $d = 955$; $d\,n = 955 \times 3 = 2{,}865$.

$$x = 2.17\sqrt{\frac{2{,}865}{3+1}} = 58.06.$$

Example.—Turning in same direction as main track curve:

$$x = 2.17\sqrt{\frac{2{,}865}{3-1}} = 82.02.$$

E. T. D. MYERS.

S. W. LEE, Chief Engineer of the St. Louis, Fort Scott & Chicago Railroad, has arrived at Walnut (Kansas) from Old Mexico. He will take charge of the permanent location of the road from Fort Scott to Odessa or Higginsville. There may be some changes in the location of the line, but the location from Hume to Butler will not be disturbed, as the grading is almost completed.

THE YAZOO BRIDGE.—The Memphis, Vicksburg & New Orleans Railroad Company is building a large iron bridge over the Yazoo, some 12 miles above Vicksburg. For some time past the construction of the piers for the bridge has been vigorously prosecuted, and the contractors are now employing about 150 experienced men. The construction of a bridge at the point selected is for several reasons unusually difficult and expensive. There is no bed-rock or other material within reach for the foundation to rest upon, and the river, even at low water, is nearly 40 ft. deep, while at high water the depth is 80 ft. or 90 ft. The bridge will consist of three spans about 300 ft. long each, two of them fixed spans, and the third a draw span in the middle of the channel. These will be some 6 ft. above the level of extreme high water, and slightly above the elevation of the banks on either side. There will be five piers, one at each end on the bank and three in the river. To obtain the requisite supporting capacity, piles—100 in the pivot and 72 in each of the other two channel piers—are driven to a depth of 40 ft. into the river bottom.

THE SUSQUEHANNA BRIDGE AT PORT DEPOSIT.—The Board of Public Works has approved the plan of the Baltimore & Ohio Railroad Company to build a bridge across the Susquehanna River at Port Deposit, 90 ft. above high water, without a draw, for their branch road to Philadelphia. The company engages to keep a tug in constant readiness for the use of vessels passing under the bridge.

THE TELEGRAPH POLES.—Another war has been begun on the electric light and telephone poles. Messrs. Ecclesine and Tomlinson, of No. 32 Park place, represent several property owners who have begun or are about to begin suits against the United States Illuminating Company to compel them to remove poles and wires from in front of their respective buildings. Among the complainants are such as the Rhinelander estate, Arnold & Taylor, and Sloan & Co., carpet dealers. There are also many others who propose to bring actions against the company.

NEW RAILROADS IN OHIO.—Three different lines of railroad are now in course of construction in Perry County: The Columbus & Eastern, which comes in at a point in Thorn township, near New Salem, and passes through the townships of Thorn, Hopewell and Madison; an extension of the Ohio Central from Buckingham to Hemlock, and an extension of the N. S. & S. up Rock Run, from near Shawnee to New Straitsville. The Columbus & Eastern, after passing through Perry County, goes by the way of Fultonham and Roseville, in Muskingum County, to McConnelsville, in Morgan County. The grading on this line is mostly through Perry County and as far as Fultonham.

THE OWENSBORO & NASHVILLE Railroad will be completed about Oct. 1. It has been difficult to secure hands on account of the small-pox, which broke out among them several months ago, and it seems hard to get rid of it. Many were frightened off, and others who were secured left before doing any work on learning the situation. Another trouble has been the caving in of a tunnel. After about 200 feet of earth were removed from it, a large quantity caved in and caused large additional labor. Again, when a passage had been effected through the hill another large quantity fell in, and a man was killed. The distance through a hill is 700 feet, and now by casing the hole up as they proceed they hope to get through without further delay.

THE N. Y., DANBURY & BOSTON RAILROAD.—Has been organized with a capital of $15,000,000. An entire new route is to be laid out between New York and Port Chester. From Port Chester to Ridgefield, Conn., the line of the New York & Ridgefield Railroad, upon which $400,000 has been expended in grading and masonry, is to be used as a section of the new road. Between Ridgefield and Danbury a link of about ten miles will complete the connection with the New England Railroad, and thus form a short route to Boston comparatively free from drawbridges.

THE NATIONAL PARK LINE OF THE NORTHERN PACIFIC.—A dispatch from the Chief Engineer of the Northern Pacific states that the last rail on the National Park Line has been laid at a point 50¼ miles from Livingstone and 53¾ miles from the park's northern boundary. The line will end there for the present, speculators having obtained possession of the intervening strip of land.

THE Chief Engineer's office at Brainerd was advised that daylight was broken through the Mullen tunnel, on the Northern Pacific, and Engineer J. T. Dodge, of the Rocky Mountain Division, made the passage through the mountain. The records show that forty-five miles of main line remain to be completed.

THE GREAT EASTERN, after lying idle for many years, is to be again put in service. A company is being formed to purchase the vessel and use her in the coal trade between Queen's Ferry (Firth of Forth) and the Thames. It is intended to put 20,000 tons on board each trip. The ship has been kept in good order.

DEATH OF AN OLD INVENTOR.—There died suddenly last week, at No. 826 Market street, Philadelphia, JAMES BLACK, who for half a century has been an inventor in mechanics. Originally a miller, he turned his attention to improvements in machinery, and, together with Dr. R. ROGERS, he took out a patent for a steam circulating boiler, which is now in use all over the United States. Over $100,000 were taken in royalties out of that single invention. Up to the time of his death Mr. BLACK was working on a new boat propeller. He was born in Northumberland County, in 1806.

NEW CALIFORNIAN WATER COMPANY.—A water company has been incorporated in San Francisco under the name of the Visitacion Water Company. The company purchased a portion of the old Bay View race-track premises and sunk a number of artesian wells in the track. Three of the wells yielded an abundant supply of water of a superior quality. Another purchase of land in the vicinity was made, and the company commenced the construtions of a reservoir on an eminence in the range of hills forming the background of the suburbs of South San Francisco. A line of pipe has been laid and operations will soon be begun.

IMPROVEMENT OF NEW YORK HARBOR.—The work of the removal of the sunken wreck of the steamship Nankin from the Swash Channel, in this harbor, which was begun a short time ago by Contractor Mr. E. McDonald, is progressing favorably. A practical submarine diver, who is in the employ of the Dock Department of this city, Mr. A. Fairchild, has been put in charge of the work as superintending inspector by Colonel G. L. Gillespie, U. S. A., who is the Government engineer, under whom the contract must be executed. Mr.

Fairchild reports, after a very thorough personal examination of the wreck, which extended over a week's time, that the work done so far by the contractor is very satisfactory, and the means employed—machinery, scows, men, etc.—show a desire to perform the contract in a thorough and faithful manner. Already some sixteen tons of material have been raised and landed on the wharf at Sandy Hook, and the prospects are that much more of the wreck will be removed before the winter weather sets in to interfere with the present operating.

The construction of the granite sea-wall at Governor's Island, the contract for which was given out last November, is progressing rapidly at the present time. This wall will be, when finished, 1,750 feet long and 8 feet in height. It will be built of granite blocks in courses, resting upon a concrete foundation laid in an excavated trench, at or near the mean low water-line. This wall starts at the coal wharf, near the main landing, and running generally in a southerly direction, terminates near the south battery. The granite for this wall is now quarried, and is all first-class materials, free from intrinsic defects. Seven courses will complete the wall, which will be 2½ feet wide on the top and 3½ feet wide on the bottom: It will be laid in cement and backed by concrete. The filling behind the wall is estimated at 40,000 cubic yards and the area of land so gained will be utilized for the necessary buildings. This wall will, in accordance with the contract, be completed by November 1.

REPORTED MURDER OF A RAILROAD CONTRACTOR.—It was stated by the assistant secretary at the office of the Mexican National Railway in this city that a report which had been telegraphed from San Antonio, Texas, of the murder of James Winters, a well-known contractor on the railway, was probably a canard. "I have good reasons for discrediting the report," said the assistant secretary. "In the first place, Mr. Winters is said to have been murdered near Saltillo, Mexico, where he had gone for the purpose of obtaining funds to pay off his employés. Now, I happen to know that he could have had no occasion to go to Saltillo for money, as the company does not disburse money from that place. Secondly, as to the statement that he was robbed of his funds, there must be some mistake, for under no circumstances would he have carried money with him in the locality named without being attended by an adequate escort." Mr. James Winters has been identified with the construction of railroads in Colorado, Texas and Mexico for five or six years past. He was originally a resident of New England and a friend of ex-President Grant, with whom he was associated in Mexican railway enterprises.

LAYING CANADIAN CABLES.—OTTAWA, August 16.—Mr. Gisborne, Government Superintendent of the Telegraph and Signal Service, who has returned from Quebec, leaves here for New York on his way to the Northwest Provinces of Canada. He will probably spend ten days in New York. During the past month the steamship Newfield, Captain Guilford, has done good service in the Gulf and lower St. Lawrence. In the first place, the Magdalen Islands and Cape Breton electric cable was picked up where broken by a schooner's anchor, eight miles from St. Lawrence, and after breaking a second time, when grappled for in rough weather, was finally repaired, and is again in good working order. Captain Guilford then picked up the Bird Rock cable about five miles south of that island, cut and buoyed the end, and then, after recovering nearly the whole of the five miles, spliced up and relaid it to the southwest corner of the rock, as directed by Mr. Gisborne, and finally Mr. Kingsford, assistant electrician of the Anglo-American cable ship Minia, ascended the cliff by the steam crane and re-established that important signalling station in connection with Grosse Isle, of the Magdalen group. Meanwhile Mr. Gisborne had organized a crew of workmen and constructed a land telegraph line across the Peninsula of Manicougan, ten miles east of Bersimis, sixteen miles in length, and upon the arrival of the Newfield laid the Bersimis to point Outardes, twelve and a half knot cable and also the Point Paradis Godbout, twenty-five and a half knot cable, it being necessary to lay the shore ends of these heavy cables in shallow water, two and a half and one and a half nautical miles respectively, Mr. Girouard, of Birsimis, permitted Mr. Gisborne, to make use of his tug and a forty ton barge, and thus an otherwise exceedingly difficult piece of work was successfully accomplished. Mr. Gisborne's gang were then landed per schooner at Trinity Bay (six miles east of Point des Monte) and will continue line construction west to Godbout and east to Pentecost River during the present season. Mr. Gisborne's great experience in wilderness land line building stood him in great stead upon the north shore of the St. Lawrence, the result being a very considerable saving to the government in cost of construction.

THE LOUISIANA LEVEES.—It is noteworthy that the people of these States—and particularly of Louisiana, where most is doing—are going ahead without reference to the action of Congress. So far as the construction of levees may be necessary for the improvement of the navigation of the river, so far can aid be expected from the Federal Government. But no farther. There is very little likelihood that Congress will appropriate money for the construction of levees for the sole purpose of reclaiming overflowed lands. It is held by some that the Federal Government ought to rebuild the broken levees for the purpose of preventing inundations, but, whether it ought to or not, it is not likely to do so.

If, therefore, the gaps are to be closed before future floods destroy property, the States or the counties must stand in the breach. There is no question about that, whether the breaks occur in Missouri, Illinois, Kentucky, Tennessee, Arkansas, Mississippi, or Louisiana. The property owners of Louisiana are accordingly on just the right track. The *Times-Democrat* says, that "the success met with in improving the levee system during the past year, and, most of all, the closing of the celebrated Bonnet Carre crevasse, which, it was believed, was more than could be accomplished even with the assistance of the railroads and the Federal Government, encourages Louisiana to hope that it will succeed, in time, in completing its levee system." Nothing so encouraging could have been said five years ago. In fact there are now only two very serious breaks in the Louisiana dike lines, and contracts have just been given out for closing both of these, namely, the Ashton crevasse, in East Carroll Parish, on the Arkansas line, and the Morganza crevasse, in Point Coupee Parish. Both jobs are to be done before next Spring brings another flood.

With regard to these two gaps, which have been open for several years, the *Times-Democrat* adds, in the notice of the above convention, that "they are so large and so expensive to close, that this has generally been regarded as beyond the power of Louisiana, with its limited resources, to accomplish. But such has been its success lately, so admirably have its levees been managed in the face of unusually strong and threatening floods, that it is hoped and believed that even these great works can be constructed." With these levees built, moreover, "Louisiana will be in better condition next winter than at any time since the war." The spirit here apparent must be regarded as promising good things for Louisiana. For the sake of the other States on the lower Mississippi, it may be hoped that more of it will spread up the river.—*St. Louis Globe-Democrat.*

IRON AND METAL MARKETS.

PHILADELPHIA, AUG. 16.

Five hundred and 1,000 ton lots of forge iron are under negotiation, but, owing to the refusal on the part of makers to accept buyers' offers, the bulk of business is restricted to 100 to 200 ton lots of forge, and trifling lots of foundry for current requirements. The furnace companies look for a strong demand because inquiries are more numerous than they have been since the early part of the summer. The stocks are light in buyers' hands, and this fact has led to inquiries and to offers, but the prices named are too low to tempt makers to close at this time. Forge iron is wanted at $17.50 at furnace; foundry, at $20 and $22. A sale of 5,000 tons of Bessemer was made at $21, and supplies are abundant for shipment at that place. Spiegeleisen is moving in lots of a few hundred tons, at $31.25. Scotch iron is nominal, and business light. Ordinary No. 1 foundry sells at $21. Best makes, $23. Nails, $3. Two or three lots of muck iron sold at $34. A few hundred tons of car iron were booked at 1.75c. in the interior. Merchant iron averages 2.15c.; prices are weak. The probability of an increase in supply accounts for the dull demand. Steel rails are quoted at $38.50 in small lots. In the absence of large transactions, it is impossible to give inside quotations. Doubleheads are $25.50, asked, with offers at $1 less. Tees, $23, to arrive, foreign stock light.

The policy of buyers in all kinds of iron is to cover current requirements, and to wait until the fall trade takes more definite shape than it has yet taken.

PITTSBURGH.

The pig iron market is improving in Western Pennsylvania, and lots of 500 and 1,000 tons are beginning to move, although the fall demand is not at hand; but large consumers think that now is the best time to place contracts, with No. 1 pig iron at $20, No. 2 at $18, and gray forge at $17, inside quotations. Outside quotations are $21.50, $20 and $18 for these kinds. Great confidence exists in an active fall trade. All the steel rail mills are busy, and the earliest delivery possible is October. Offers are in hand at $37.50. Old rails are $23 to $24; no stocks, and buyers refuse to negotiate at this price. Merchant bar is 1.90c. Shipments are made to remote points at less. Muck bars, $34. Bessemer iron, $21. Nails, $2.90. All the factories are in operation. The Structural Mills are receiving fresh orders. The undertone of the market is good.

CHICAGO.

All kinds of pig iron are in active demand in small lots. Stocks are too scarce and prices too high to induce some of the larger consumers to place fall contracts. The prospects are fairly encouraging, both as to prices and demand. Charcoal irons are held with a little more firmness than 2 weeks ago because of the fact that the stocks are not very large. Southern irons are in fair supply. Scotch iron is moving in small lots. The ore market is extremely unsettled, and prices are pointing upward, owing to the restriction in output. Notwithstanding the fact that stocks of nails are light, prices are weak. The Western mills have started up. Prices are $3.05@$3.15. Fall buyers have been waiting to see whether makers could hold their own. It is believed that an active demand will be developed in September. The demand for merchant iron lacks activity. A slight advance has been made in tubes, pipes and fittings. Pig lead, 4.07½c. Builders' hardware is in fair demand.

TRUSS BRIDGES.

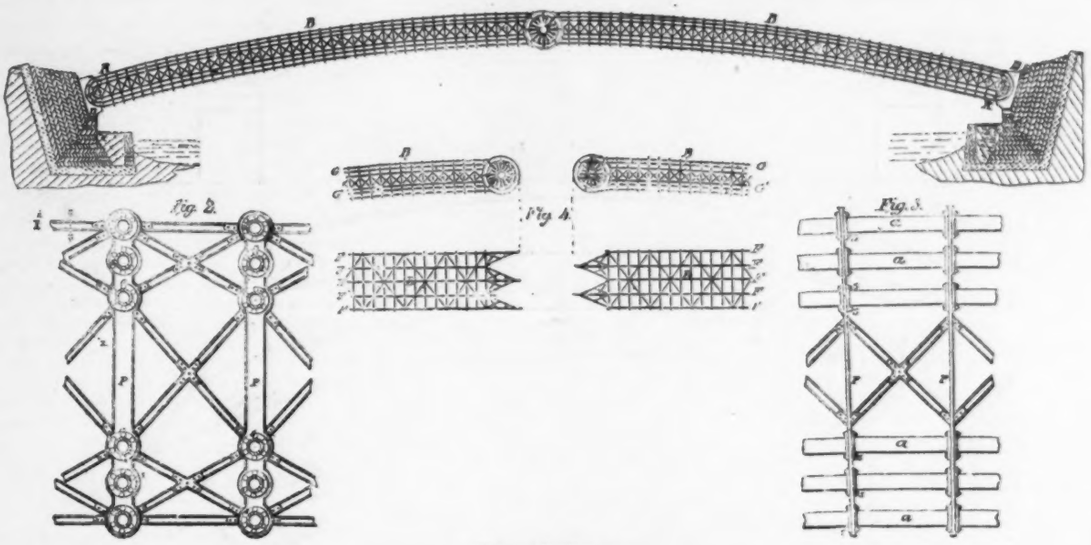
The following invention consists of certain improvements in the construction of the bridge, granted to Linville & Piper, January, 14, 1862. Linville & Piper's present improvement is dated October 31, 1865.

The truss, shown by the cuts, is similar to their earlier construction; the improvements being, first, the posts, instead of being made of two rolled plates of iron of semi-polygonal transverse section, united by rivets pasing through the center of the polygon, and sprung apart by distance plates, are made of two or more plates of wrought iron, with flanges at the edge, the plates being so united as to make hollow posts by rivets passed through the flanges, and each plate being arched longitudinally by means of ferrules placed at intervals between the flanges and around the rivets. Instead of casting the bases and capitals on to the ends of the posts, the inventors use bases and capitals connected by rivets to the post. Secondly, instead of making the upper chords of hollow cast-iron sections or short tubes, they construct the upper chords of a combination or wrought iron *I* beams, or channel bars, connected by iron plates, so as to form cellular chords of great strength and capacity of resisting either transverse strain or longitudinal compression. Thirdly, bottom chords of thin wrought iron are used, the eyes of which, at each end, instead of being punched or forged out, are upset, so as to give the eye of the bar a degree of strength equal or superior to that of the bar at any point of its mid-length.

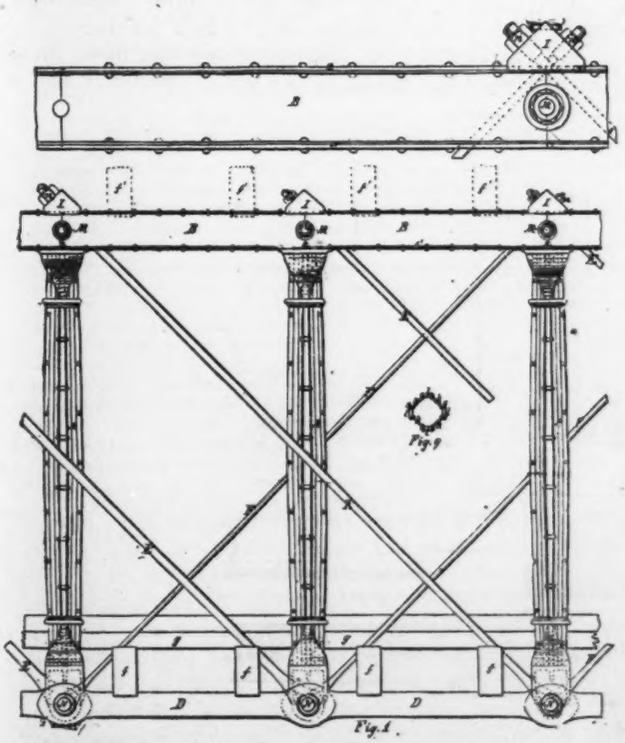
The truss bridge of Joseph E. Kauser, November 7, 1865, consists of a system of parallel arches *F*, trussed securely together by horizontal and oblique braces *f*. The extrados

and intrados comprise a series of hollow cylinders *a*. The exterior and interior lines of the truss consist each of three series of these tubes *a*. *P* are iron plates, to which are attached the arches, and are braced as represented. From this construction it is seen that the stress produced, as well by inherent as extraneuos weight, will act in the direction of the longitudinal axis of the tubes *a*, and consequently in the direction of their greatest power of resistance. But, in order to make this construction practicable, there must be combined with it some device for neutralizing the expansion and contraction of the materials, and thus protect the interior parts, as well as the abutments from the effects of such forces. To accomplish this, Kauser's bridge is constructed in two distinct parts. The semi-arches or parts forming each half of the bridge terminate at the highest point alternately in concave and convex ends, so as to fit into each other, and being provided with side pieces to prevent lateral displacement. The lower ends of the arches are also rounded off, and fit exactly in the concave cast-iron supports *D* fastened to the abutments. There will thus be two fixed rotation points *R*, one at each end of the bridge, and one movable rotation point *C* at the center. The effect of expansion will thus be to lift up the whole structure; the central rotation point *C* rising, and the semi-arches tending to revolve about it, and at the same time tending to revole around the fixed rotation points *R*. Then, as the materials contract, the arches sink back into their original position without having injured or displaced any part of the bridge.

Fig. 1

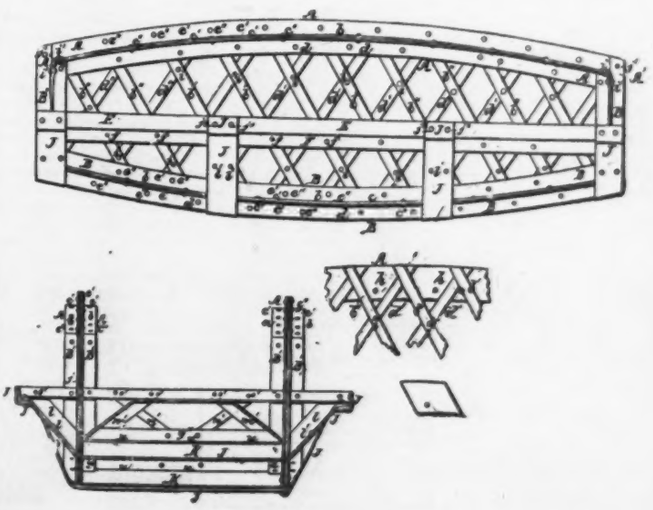


KAUSER'S TRUSS.



LINVILLE AND PIPER'S TRUSS.

The nature of Rembrandt Lockwood's bridge, which he patented December 5, 1865, consists in combining a number of open boxes of wrought or cast-iron, with iron bands or rods, keyed or bolted in such a manner as to distribute the strain over the whole bridge, after which, the boxes are filled with concrete or masonry, and the superstructure built as the taste of the builder or the practical use of the bridge may call for.



KREMER'S TRUSS.

Speaking more in detail, the arch is made of a series of iron boxes cast to the curve of the arch, and the ends on a line of the radius rector of the arch. The arch is combined by iron bands, breaking joints with each other and keyed. Then the boxes are filled with concrete; it strengthens them and keeps the sides from deflecting out

of line, besides making the whole arch of the bridge solid and adding great strength to the structure.

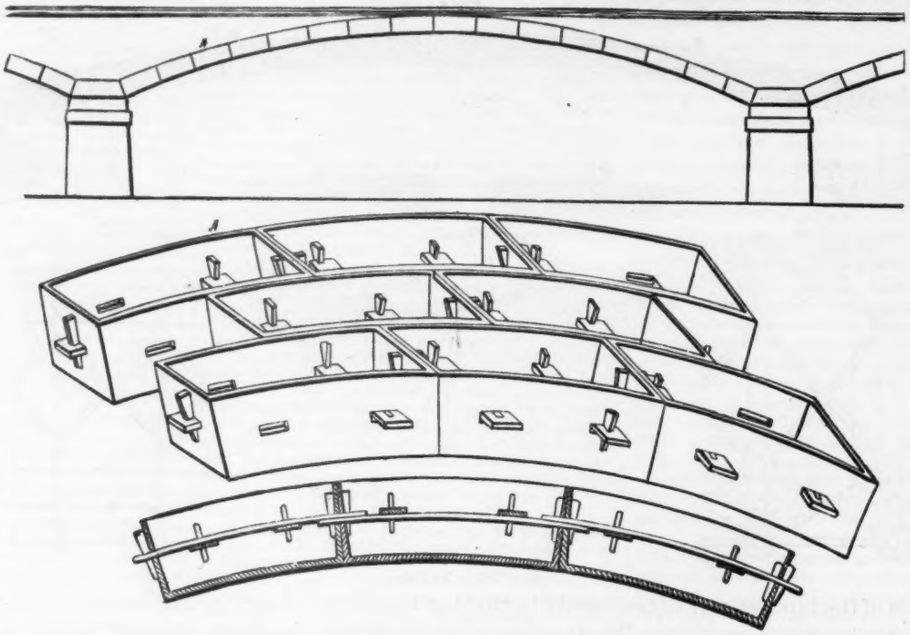
February 13, 1866, L. K. Cole and Howard Soule, Jr., of Syracuse, devised a bridge which is fully shown by the cuts herewith presented.

V represents the wood-work of the truss; *B* is a continuous iron chord, having an adjustable nut which bears against the shoes. *C* is the upper portion and *D* is the bottom of this shoe; while *E* and *F* are the rear, and *G* the front plates thereof. Bolts *I* pass through the truss beams and shoe. *L* are bolts passing through both the cross-ties and shoe. *H* is the continuous box-splice.

By a continuous iron chord in connection with the adjusting nut and shoe, facilities are afforded for the removal and renewal of the wooden braces without affecting the general tension of the chord; also, for so adjusting and equalizing the strain that each chord and brace shall bear its proportionate strain.

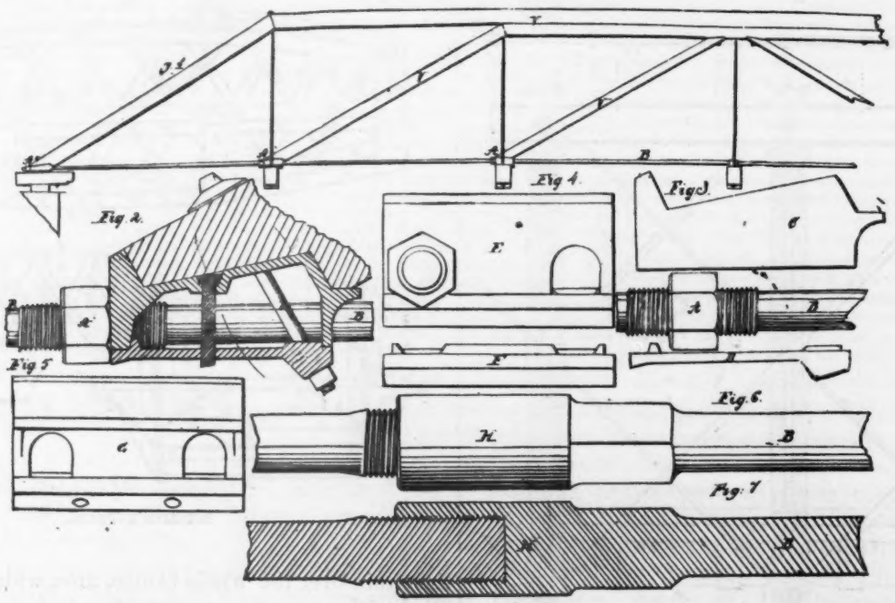
In long spans, it is stated, for convenience of manufacture and transportation, it is desirable to keep the chord in two sections. The inventors, therefore, make the chord continuous by a tubular box-splice *H*, consisting of a long nut welded for a portion of its length, to one section of the chord, and a thread cut in the balance of the nut to correspond and form a connection with the raised thread of the other section of the chord.

Martin Kremser's construction (February 27, 1866) is of the "lattice" order, made of rolled iron put together without forging.



LOCKWOOD'S TRUSS.

There is a peculiar solidity and firmness given Kremer's bridge, by means of the main and counter braces, they being secured by plates to the chords in a manner which prevents the bridge from sagging or swerving down from the ends toward the middle by the braces springing out of place, for the plates on both sides of the braces (fitting close on to the edges and being firmly secured by rivets between the angle irons of the chords), will at all times retain the braces in line and at the proper tension in relation to the load upon the bridge. The weight of the load, or vertical pressure upon the bridge, is sustained and transmitted from the main to the counter-balances in the usual way.



COLE AND SOULE'S TRUSS.

[TO BE CONTINUED.]